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Full Name of Author — Nom complet de l'auteur
GATERE, KAREKO

Date of Birth — Date de naissance MARCH 27 1947	Country of Birth — Lieu de naissance KENYA

Permanent Address — Résidence fixe
DEPT OF AGRICULTURAL ECONOMICS
UNIVERSITY OF NAIROBI
P.O. Box 29053 NAIROBI, KENYA.

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THE UNIVERSITY OF ALBERTA

MARKET EFFICIENCY IN KENYA: A STUDY OF THE MARKETING SYSTEM FOR FRUITS AND VEGETABLES

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

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EDMONTON, ALBERTA

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THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled MARKET EFFICIENCY IN KENYA: A STUDY OF THE MARKETING SYSTEM FOR FRUITS AND VEGETABLES.

submitted by KAREKO GATERE

in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

Supervisor

T. S. Veeman

Melville McMillan

T. J. Richter

C. F. Bentley

Helen C. Abell

External Examiner

Date Nov. 30 1979

ABSTRACT

This study evaluated the working of the marketing system for fruits and vegetables in Kenya. Trade in fruits and vegetables was uncontrolled by any marketing board or organization, unlike the marketing of other basic staples in Kenya. Concepts of static pricing and technical efficiency were applied in the analysis, but no comparison was made with alternative marketing systems.

The predictions of the perfectly competitive model were combined with efficiency concepts of the industrial organization model to assess pricing efficiency at the wholesale and retail levels. At the retail level, price movements in spatially separated retail outlets were compared by computation of simple correlation coefficients. Price correlations were not perfect, but the deviations from the perfectly competitive ideal were attributed to discrepancies in the sales units used which tended to conceal price differences. Gaps in the availability of price information, lags between the time information was received and acted upon and the lack of uniform grades for commodities were also thought to explain the departure from the perfectly competitive ideal. There was no evidence of market structure imperfection at the retail level.

At the wholesale level, market structure variables like the four-firm concentration ratios, the number of sellers (firms) and the total quantity were tested for their impact on price levels in a linear regression framework. Of the eight commodities selected, only trade in onions showed evidence of market structure imperfection. This was attributed to the effect of trade licensing procedures introduced in

1967 that resulted in the concentration of trade in onions to a few firms.

Physical losses in the marketing system were used as an indicator of technical efficiency. Losses in the marketing system between the wholesale and retail levels were estimated at 15 percent. Losses of produce were attributed to the use of packaging containers which made handling difficult, trapped moisture and resulted in bruised and rotten produce. The packaging containers used made it difficult to examine the quality of produce and encouraged "padding" of produce with extraneous matter and substandard produce.

The major conclusions from the study were that the marketing system at the wholesale and retail levels was price efficient, but technically inefficient. It was recommended that improvements be made in the physical infrastructure of the market system, like better construction and reorganization of the wholesale market in Nairobi. It was also suggested that some form of produce inspection be instituted to screen damaged produce.

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Wendy Williamson competently typed all the drafts and went out of her way to make editorial changes and so many other things outside the call of her duty. Wendy, I would have been lost without you.

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CHAPTER I

INTRODUCTION AND NATURE AND SCOPE OF THE PROBLEM

Introduction

Since World War II, attention and resources have been directed toward economic development in the less developed countries of the world. In the intervening years, efforts of national governments and donor agencies have increased, but shifts in the sector(s) to be emphasized have occurred. Earlier development efforts laid emphasis on the industrial sector on the premise that industrialization would lead to creation of employment, increase growth in the Gross National Product and that progress in agriculture would follow automatically from the process of industrialization. Current efforts recognize the size and importance of the agricultural sector in terms of possible "factor contributions" and "market contributions".[1] Such contributions include the provision of foodstuffs and raw materials to other sectors of the economy, provision of investable surpluses, earning of foreign exchange, release of labour to other sectors of the economy and provision of a market for other sectors' products and services.

This study deals with the marketing system in Kenya for fruits and vegetables. A market system generates price signals that guide the allocation of resources and is therefore an important subset of the development continuum. In this chapter, the nature and scope of the problem is outlined, the objectives of the study are summarized together with the format of the study.

---

[1] Simon Kuznets, Economic Growth and Structure (New York, 1965), pp. 244-245.

1.2 Nature and Scope of the Problem

Kenya faces a critical task in increasing the production of food for a fast growing population. The population of Kenya in 1976 was estimated to be growing at a net rate of 3.7 percent per year.[1] In the last three five-year development plans, efforts to increase food production have been built around the development and breeding of high yielding crop variables suited to the various ecological zones of the country, especially maize, and the encouragement of the diffusion and adoption of these varieties by farmers in the country. Emphasis has also been placed on better supply of inputs such as fertilizers and pesticides, the provision of producer credit and the encouragement and control of marketing organizations.

In this study the focus of attention is on the marketing system, whose crucial role in agricultural development hardly needs stressing. The role of the marketing system in stimulating agricultural production is recognized in Kenya's current and previous development plans, and, in fact, dates back to the earlier part of this century. In the case of maize, the government of Kenya has a long history of market intervention dating as far back as the 1920's.

Kenya today has about seventeen marketing boards regulating such commodities as maize, wheat, coffee, tea, dairy products, beef, cotton and pyrethrum, to list but a few. The powers and methods of operation of the boards vary. Typically, for export commodities, with the exception of cotton, these powers do not include price fixing. For domestically consumed commodities, however, pricing is a major responsibility of the marketing boards.

---

[1] Calculated from: Central Bureau of Statistics, Kenya Facts and Figures, Ministry of Finance and Planning (Kenya, 1976).

There are long-standing complaints that the degree of control in the marketing system in Kenya is excessive,[1] but despite public statements to the contrary,[2] there are still no signs that marketing control is being reduced.

This study started with four basic observations, the first three of which were noted above: 1) the large number of marketing boards; 2) the calls for decontrol; 3) the central place of price control for domestically consumed commodities; and 4) the existence of uncontrolled trade in price controlled commodities, side by side with marketing board operations. According to the best estimates available, the Maize and Produce Marketing Board only handles about 10 percent of the total maize crop in Kenya.[3]

Given that decontrol might be a future marketing policy in Kenya, what can we learn from the working of the uncontrolled system before a complete shift in policy is implemented? Should complete decontrol be implemented or should it be restricted to some functions of the marketing system?

---

[1] See for example: East Africa Royal Commission 1953-1955 Report, Her Majesty's Stationery Office (London, 1955); and Marvin P. Miracle, "An Economic Appraisal of Kenya's Maize Control," Eastern Africa Economic Review, Vol. 2 (1959).

[2] Republic of Kenya, Development Plan 1970-74, Government Printer (Nairobi, 1970), p. 238; and Republic of Kenya, Development Plan 1974-78, Government Printer (Nairobi, 1974), p. 234.

[3] Judith Heyer, "The Marketing System," in J. Heyer, J.K. Maitha and W. Senga, eds., Agricultural Development in Kenya: An Economic Assessment (Nairobi: Oxford University Press, 1976), p. 324.

To answer some of these questions, it was necessary to study a completely uncontrolled system in order to separate the effects of control and partial control. The marketing of fruits and vegetables was identified as the one uncontrolled system. Eight commodities were chosen for study: bananas, cabbages, carrots, green maize, oranges, potatoes, tomatoes and onions. Onions were included in this study although the source of supply and the number of agents were controlled by the Horticultural Crops Development Authority, but the prices were not controlled at either the wholesale or retail levels.

Another subproblem is that despite the large number of marketing boards and the problems that occasionally arise, the marketing system is not well researched in Kenya. Maize marketing is by far the best documented both by various commissions of inquiry and independent researchers. Beyond this, there have only been a few studies such as those of Alvis and Temu,[1] the study by Wilson[2] on the marketing of fresh fruits and vegetables, and the four-country study of marketing in Africa by Jones.[3] The above studies are of a broader nature, but there are others that concentrated on smaller areas and specific commodities.

---

[1] V.Q. Alvis and P.E. Temu, The Marketing of Selected Staple Foodstuffs in Kenya, Department of Agricultural Economics and Office of International Programmes (West Virginia University, 1968). Unpublished.

[2] F.A. Wilson, Some Economic Aspects of the Structure and Organization of Small Scale Marketing Systems: Marketing of Fruit and Vegetables in Kenya, University of Nairobi, Institute for Development Studies, Discussion Paper No. 176 (1973).

[3] William O. Jones, Marketing of Staple Food Crops in Tropical Africa (Ithaca: Cornell University Press, 1972).

These include the studies by Maritim,[1] Heinrich[2] and Holsten.[3] The findings of some of these studies will be reviewed later.

This study, where possible, was built upon the previous studies in assessing the efficiency of the uncontrolled marketing system in Kenya. It was not a comparative study between the workings of the private marketing system and the marketing board system. Instead, concepts of static pricing and technical efficiency were utilized to find out what could be learned from the workings of the uncontrolled system only. The basic predictions of the perfectly competitive norm were combined with the market structure variables of the industrial organization model to assess pricing efficiency. Physical losses of produce in the marketing system were used as a proxy for technical efficiency.

Concepts of static efficiency were used as a starting point around which future studies could be based. Other issues of marketing policy such as increasing producer returns, stabilization of prices and incomes, and equity and the collection of government revenues, were not dealt with. These issues usually form the basis for market intervention, but important as they are, they could not be handled within the framework of this study.

The data used in this study were collected in the months of May, June, July and August, 1978 and involved gathering of primary and secondary data mainly in the City of Nairobi. The City of Nairobi was chosen for several reasons: 1) it was not possible to cover the whole country because of the cost this would have entailed and the short time available; 2) Nairobi is the major consuming centre for marketed agricultural commodities in Kenya and had a marketing system similar to the rest of the urban centres in the country; and 3) there were some previous studies on which the present study could build upon.

---

[1] L.H. Maritim, Analysis of Produce Flows to Wakulima Wholesale Market, Nairobi, Agricultural Economics Studies No. 3, Department of Agricultural Economics, University of Nairobi (1977).

[2] F. Heinrich, Basic Data on the Domestic Horticultural Marketing System in Kenya (Nairobi, 1972: Berlin, 1975).

[3] G. Holsten, Wakulima Wholesale Market Survey (Nairobi, 1973). Unpublished.

1.3 Research Objectives

The following were specific objectives in this study:

1) To describe the marketing channels, intermediaries and other functionaries involved in the marketing process.

2) To describe the conditions of entry into the marketing system.

3) To estimate the extent of physical losses of produce in the market system and how these differed between market channels.

4) To evaluate the marketing system in terms of pricing and technical efficiency.

5) To indicate areas of possible improvement, based on the results of the study.

6) To indicate in which areas market intervention would be desirable, based on the results of the study.

1.4 Hypotheses Tested

The following hypotheses were tested with respect to each of the selected commodities:

1) There were no significant price inefficiencies in the market system in Nairobi.

2) Market structure had no significant influence on prices at the wholesale level.

3) Fruit and vegetable retailers in Nairobi had no significant influence on prices.

4) There were no significant technical inefficiencies in the market system in Nairobi.

1.5 Organization of the Study

Subsequent chapters will be organized in the following way: Chapter II will describe agriculture in Kenya and the production and consumption of fruits and vegetables. Chapter III describes the present market structure and channels, while Chapter IV deals with the review of relevant studies and examines market efficiency studies in less developed countries. In Chapter V, the methodology, data and models used in this study are presented, while Chapter VI presents the results of the empirical analysis. In Chapter VII, the summary, conclusions and recommendations of the study will be presented.

CHAPTER II

AGRICULTURE IN THE KENYA ECONOMY AND THE PRODUCTION AND CONSUMPTION OF FRUITS AND VEGETABLES IN KENYA

2.1 Overview of Agricultural Production in Kenya

Kenya is a country of contrasts in topography, climate and soils which, in turn, cause diversity in cropping patterns and farm enterprises. Conditions range from tropical rain forests at the coast through a limited Afro Alpine Zone in the centre, to near desert conditions in the North. Within these climatic ranges grow a variety of crops, the most important of which are maize (corn), coffee, tea, cotton, wheat and a variety of tropical fruits and vegetables.

Agriculture is the largest single sector in Kenya, accounting for up to 28.6 percent of the Gross Domestic Product (outside and in the monetary economy) in 1975. Manufacturing accounted for 11.8 percent of the Gross Domestic Product in 1972 and this share had risen to 13.3 percent in 1975. Table 2.1 shows the percent share of gross product for various sectors of the economy. The primary industries of agriculture, forestry and fishing account for 34.2 percent of the Gross Domestic Product in the economy.

The majority of the people in Kenya live in the rural areas and are directly dependent on agriculture for their livelihood and incomes. In terms of wage employment, agriculture and forestry account for more than one-third of the labour force in wage employment. Table 2.2 shows the breakdown of wage employment by industry and the proportion accounted for by agriculture and forestry for the years 1972 to 1975. The proportion of the labour force in agriculture and forestry in wage employment was about 34 percent in 1972 and 1973, but declined in 1974

Table 2.1 Gross Domestic Product, Kenya, 1972-1975. Percentage of Total Gross Product at Constant (1972) Prices for Various Sectors of the Economy.

	Percentage			
	1972	1973	1974	1975
Gross Product at Factor Cost				
A. Outside Monetary Economy				
Agriculture	16.7	15.8	15.6	15.6
Forestry	.7	.7	.7	.7
Fishing	1.8	1.7	1.7	1.7
All Others	2.9	2.9	2.9	2.9
Total Product (Outside Monetary Economy)	22.1	21.1	20.9	20.9
B. Monetary Economy				
Agriculture	14.3	13.9	13.2	13.0
Forestry	.5	.6	.6	.6
Fishing	.2	.2	.2	.2
Manufacturing	11.8	12.7	12.9	13.3
All Others	51.1	51.5	52.2	52.0
Total Product (Monetary Economy)	77.9	78.9	79.1	79.1
Total Gross Product	100.0	100.0	100.0	100.0

Source: Adapted from Statistical Abstract, Kenya, 1976.

and 1975. It is difficult to say whether this trend would continue. The number of self-employed people in agriculture involves about 90 percent of the population, and with a net increase in population of 3.77 percent, it is reasonable to assume that the absolute numbers dependent on agriculture are increasing and are likely to increase in the foreseeable future.

In terms of the contribution to exports, agriculture is still the largest sector, accounting for over 40 percent of the value of export earnings. Table 2.3 shows the industrial analysis of exports for

Table 2.2 Wage Employment by Industry in Kenya, and Percentage of Wage Employment in Agriculture, 1972-1975.

Industry	Number			
	1972	1973	1974	1975
Agriculture and Forestry	246,851	265,356	261,148	240,609
Mining and Quarrying	3,166	3,107	3,869	3,543
Manufacturing	84,804	94,453	101,332	100,731
Electricity and Water	5,148	5,374	5,694	7,742
Construction	37,604	41,219	44,437	40,522
Wholesale and Retail Trade, Restaurants and Hotels	47,638	46,575	57,021	53,690
Transport and Communications	45,313	44,079	46,310	45,475
Finance, Insurance, Real Estate and Business Services	17,477	20,270	21,896	24,090
Community, Social and Personal Services	231,775	240,942	284,556	302,684
TOTAL	719,777	761,375	826,263	819,086
Percent in Agriculture and Forestry	34.30	34.85	31.61	29.38

Source: Adapted from Statistical Abstract, Kenya, 1976.

the years 1970 through 1975. Taken together, agriculture, forestry, hunting and fishing accounted for 48.63 percent of all exports in 1973. The category of food, beverages and tobacco, which has a close relationship with agriculture, is also important, accounting for more than 10 percent of export earnings in most of the years under consideration. Thus, using the measures of contribution to Gross Domestic Product, wage employment and export earnings, agriculture is a dominant sector in the Kenya economy.

The size structure of agricultural production units varies from extremely small subsistence family farms to large scale modern and highly mechanized corporate farms. Over the last two decades, the share of

Table 2.3 Industrial Analysis of Exports, Kenya, for 1970 through 1975, by Percentage of Value.

	1970	1971	1972	1973	1974	1975
Agriculture	43.70	37.19	42.42	45.27	41.77	38.56
Forestry	.68	.87	.22	.53	.53	.83
Hunting	.38	.55	.93	2.58	1.05	.77
Fishing	.28	.52	.27	.25	.21	.17
TOTAL	45.04	39.12	43.84	48.63	43.56	40.33
Mining and Quarrying (Total)	.24	.23	.09	.29	.41	.66
Food, Beverages and Tobacco	12.83	12.97	14.91	13.10	9.73	9.89
Textiles and Clothing	2.30	2.64	2.00	2.24	1.95	1.50
Leather and Footwear	1.37	1.39	.98	.78	.40	.49
Wood, Cork and Furniture	2.03	1.99	.96	1.18	1.14	.93
Paper and Printing	2.67	3.35	2.58	2.77	2.78	3.03
Animal and Vegetable Fats and Oils	.51	.80	.85	.94	.80	.66
Chemicals and Rubber	10.49	11.92	11.65	10.26	9.65	8.00
Petroleum and Coal Products	13.76	16.64	15.79	13.26	21.64	27.37
Building Materials, Pottery and Glass	3.40	3.12	2.58	2.21	2.54	3.23
Metal Manufacture	3.06	3.35	2.17	2.81	3.42	2.20
Machinery	1.42	1.48	.82	.95	.84	.59
Transport Equipment and Miscellaneous Manufacturing	.88	.99	.78	.85	1.19	1.11
TOTAL	54.96	60.65	56.07	51.07	56.03	59.00
All Exports (Total)	100.00	100.00	100.00	99.99	100.00	99.99

Source: Adapted from Statistical Abstract, Kenya, 1976.

marketed output accounted for by small farms has risen from 18.0 percent in 1954 to 50.9 percent in 1974.[1] However, there are no crops associated with a particular group of producers. The small producers grow the same mix of crops and other enterprises as the large producers, the main difference being only in scale. The only exception seems to be sisal, which in Kenya is grown in the estate sector. Permanent crops are the most important, accounting for up to 51.2 percent of total marketed production. Table 2.4 shows the shares of commodity groups in net marketed production.

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[1] Republic of Kenya, Economic Survey, 1975.

Table 2.4 Shares of Commodity Groups in Gross Marketed Production, 1964 to 1974 (Percentage of Value).

Year	Cereals	All Other Temporary Crops	Permanent Crops	Livestock and Products	Total
1964	11.2	11.5	51.0	26.3	100.0
1965	12.2	13.1	46.3	28.4	100.0
1966	10.2	12.9	49.3	27.6	100.0
1967	14.4	15.9	40.2	29.5	100.0
1968	18.4	15.3	37.0	29.3	100.0
1969	15.1	15.8	41.5	27.5	100.0
1970	10.4	16.5	46.3	26.8	100.0
1971	12.4	17.0	40.6	30.0	100.0
1972	12.2	15.7	42.4	29.7	100.0
1973	11.7	14.0	48.2	26.1	100.0
1974	12.1	14.6	51.2	22.1	100.0

Source: Republic of Kenya, Economic Survey, 1970 and 1975.

In terms of value, permanent crops are followed by livestock products, cereals, and all other temporary crops. In quantity terms, however, maize is by far the most important (sugar cane has more tonnage, but this is before crushing and extraction). Table 2.5 shows the principal crops for sale by quantity. It should be noted that in the case of food crops, the bulk of the output is consumed on the farms on which it is produced and never enters the market system. The figures in Table 2.5 refer to deliveries to various marketing bodies.

Table 2.5 Principal Crops in Kenya: Production for Sale 1967-1976 (in 1,000 Metric Tons).

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Wheat	162.2	216.3	241.6	221.5	205.7	164.4	124.6	159.5	158.1	180.1
Maize	248.8	352.6	280.3	205.7	256.6	373.0	440.8	365.4	487.8	521.7
Rice Paddy	15.9	18.7	22.7	28.5	30.0	33.8	36.1	33.2	32.1	37.5
Pyrethrum Extract	0.1	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Sugar Cane	706.4	947.2	1300.7	1451.2	1378.0	1062.3	1545.1	1719.1	1654.6	1766.0
Seed Cotton	12.7	14.3	17.1	14.0	16.0	17.0	16.2	15.0	16.1	16.2
Clean Coffee	48.0	39.6	52.4	58.3	59.5	62.0	71.2	70.1	66.2	73.5
Sisal	51.7	50.3	49.8	43.9	44.8	41.2	58.1	86.5	43.6	35.0
Tea	22.8	29.8	36.1	41.1	36.3	53.3	56.6	53.4	56.7	60.0

Source: Republic of Kenya, Statistical Abstract, 1976.

Among food crops, maize is the major staple, providing the bulk of the calorific intake of the population. Most maize (approximately 90 percent) is produced on small farms, and small farmers are rapidly adopting high yielding hybrid maize varieties. The second most important cereal is wheat, but production in recent years has been declining due to the higher prices for maize and dairy production. Rice is another important cereal, but even with increasing production, some is still imported to meet domestic demand. Production of rice is limited to irrigated areas which are expensive to establish and expand. Other cereals produced are barley, sorghum and millet; these are still produced in traditional systems and have not assumed commercial significance. Other important crops include beans, peas, grams, potatoes, cassava and vegetables of all types. Table 2.6 gives more detail on the values of gross marketed production for the important product categories. Tables 2.5 and 2.6 show a steady increase in the production of most commodities, but some year-to-year variations are attributable to weather conditions. Agricultural products continue to be the major foreign exchange earners, with the principal exports being coffee, tea, sisal, meat and meat preparations, pyrethrum and cotton, among others.

2.2 Production of Fresh Fruits and Vegetables

Data on the production of fruits and vegetables as indicated in Table 2.6 can either be classified under "Fruit and Other Permanent Crops" or "Other Temporary Crops". All tree fruits would come under the former category, while the latter includes pulses such as beans, pigeon peas, etc., and root crops such as cassava, potatoes, yams and different kinds of vegetables. Further disaggregation into individual commodities or even narrower product classes cannot be done from official statistics.

Table 2.6 Value of Gross Marketed Agricultural Production in Kenya, 1972-1976.

		1972	1973	1974	1975	1976
				(K'000)		
Cereals						
Wheat		4,160	3,865	6,925	8,275	10,003
Maize		7,252	8,571	8,482	17,022	18,838
Barley		477	976	1,148	1,662	1,829
Rice		859	906	974	1,995	2,569
Other Cereals		205	173	129	142	300
	Total:	12,953	14,491	17,658	29,096	33,539
Temporary Industrial Crops						
Pineapples		326	412	384	520	789
Castor and other oil Seeds		272	235	495	680	700
Pyrethrum		3,662	3,259	4,206	4,383	4,408
Sugar Cane		3,038	4,453	5,916	8,230	9,234
Cotton		980	983	1,167	1,549	1,561
Tobacco		31	30	34	87	123
	Total:	8,309	9,372	12,202	15,449	16,815
Other Temporary Crops						
Pulses		753	416	1,027	1,181	750
Potatoes		1,723	1,551	2,122	2,240	2,500
Other Temporary Crops		1,773	1,596	2,207	2,538	2,540
	Total:	4,249	3,563	5,356	6,159	5,790
Permanent Crops						
Coffee		24,165	32,772	35,326	33,061	76,108
Sisal		1,862	7,051	18,350	7,038	5,250
Tea		16,034	16,766	19,255	22,914	24,300
Coconuts and products		572	515	540	594	508
Wattle		530	468	472	370	480
Cashew Nuts		638	862	959	1,061	1,482
Fruit and other permanent crops		1,080	972	1,206	1,124	1,200
	Total:	44,881	59,406	76,108	66,162	109,328
Total Crops:		70,392	86,832	111,324	116,866	165,472
Livestock and Related Products						
Cattle and calves for slaughter		16,510	16,353	17,610	19,827	20,538
Sheep, goats and lambs for slaughter		825	975	1,137	1,339	1,369
Pigs for slaughter		631	651	728	856	901
Poultry and eggs		1,207	1,360	1,104	1,597	1,600
Wool		205	503	480	252	267
Hides and Skins		1,170	1,205	1,298	1,461	1,513
Dairy Products		10,890	11,305	11,100	10,781	12,483
	Total:	31,438	32,172	32,457	36,113	38,671
Unrecorded Market Production		4,100	4,299	4,668	5,374	5,800
TOTAL		105,931	123,303	148,449	158,353	209,943

Source: Republic of Kenya, Statistical Abstract, 1976.

Statistics on the production of fruits and vegetables largely escape the "net" of official statistics for three reasons. One is the very small quantities in which fruits and vegetables are grown and consumed. Typically, many households in Kenya grow their own fruits and vegetables, and any surplus over domestic consumption is sold away quickly lest it rots. Secondly, there is a high degree of local trade and different local and seasonal patterns of production. Finally, trade in fruits and vegetables is essentially "free" in the sense that there is no national organization dealing with these products. Collection and publication of data under such conditions is expensive; however, some export business for horticultural crops is picking up and some data are becoming available from that source.

Table 2.7 shows quantities of selected fruits and vegetables traded in the Wakulima Wholesale Market in Nairobi for the period August 1977 to July 1978. The quantities were compiled by adding up daily quantities recorded in receipts issued to market entrants on payment of produce cess. A cess is a levy on produce charged by local authorities for the use of market facilities. The cess is charged to every market entrant bringing produce to market and the fee charged, together with type and quantity of produce, is recorded. Duplicate receipts are retained by market inspectors, with dates properly marked.

This method of estimation was found to be the most practical, but it had two major drawbacks. One was that since the task was very tedious, it was necessary to restrict the estimation to the selected commodities. Secondly, it was observed that some produce entered the market without being recorded and it was not possible to verify the quantities so entered. The figures obtained in this study are therefore lower than

Table 2.7 Quantities of Selected Commodities Traded in the Wakulima Wholesale Market, Nairobi, Kenya, August 1977 through July 1978.

(Quantities in Metric Tons)

	Potatoes	Cabbages	Tomatoes	Oranges	Carrots	Green Maize	Bananas	Onions
August	1,493.2	326.3	193.1	80.2	33.0	342.3	121.0	10.1
September	1,070.4	207.1	84.9	32.0	58.3	209.1	175.8	10.9
October	1,053.5	330.5	144.1	46.2	113.4	267.4	177.2	14.8
November	1,055.5	264.4	69.6	29.1	90.2	241.3	78.6	20.4
December	1,367.5	497.3	101.1	53.4	121.2	222.5	138.4	17.4
January	658.5	290.3	118.3	37.9	41.6	69.2	238.1	12.5
February	1,614.2	1,040.5	144.9	48.7	113.3	304.8	439.2	25.6
March	1,188.1	1,087.6	179.6	93.0	48.6	205.0	461.2	12.5
April	984.1	1,287.4	230.2	175.4	42.8	130.4	380.6	16.2
May	1,294.3	1,765.0	366.3	219.3	66.8	285.3	633.6	18.2
June	648.4	970.7	103.4	308.4	25.9	134.6	229.2	5.1
July	1,576.3	1,237.3	347.7	278.2	42.2	405.8	446.2	9.6
Total	14,004.0	9,304.4	2,083.2	1,401.8	797.3	2,817.7	3,519.1	173.3

Source: Cess Receipt Books, Nairobi City Council, Kenya, 1977 and 1978.

those estimated by other authors.

Table 2.7 also shows estimates of the commodities traded in the wholesale market. The most important commodities in 1977/78 were potatoes, cabbages and green maize, with 26,000 metric tons between them. Table 2.8 shows estimates of the commodities traded by various authors.

Table 2.8 Estimates of Quantities of Fruits and Vegetables Supplied to Wakulima Wholesale Market, by various authors.

	Wilson[1] (1969)	Heinrich[2] (1972)	Holsten[3] (1973)	Maritim[4] (1977)	Gatere[5] (77-78)
Fruits	-	16,108	16,834	-	1,402
Vegetables	-	47,633	25,648	-	32,699
Total	38,365	63,741	42,482	50,400	34,101

Source: (1) F. Wilson, The Marketing of Fruits and Vegetables in Kenya, Institute for Development Studies (Nairobi, Kenya, 1973).

(2) F. Heinrich, Basic Data on the Domestic Horticultural Marketing System in Kenya (Nairobi, 1972: Berlin, 1975).

(3) G. Holsten, Wakulima Wholesale Market Survey (Nairobi, 1973). Unpublished.

(4) L. Maritim, Analysis of Produce Flows to Wakulima Wholesale Market, Nairobi, Agricultural Economics Studies No. 3, Dept. of Agricultural Economics, University of Nairobi (1977).

(5) Estimates made for this study for the selected commodities only.

The estimates made by various authors vary widely, which may be due to different estimation procedures. Maritim based his estimates on recorded quantities, then used an adjustment factor to correct for unrecorded produce entering the market. All the other authors estimated physical quantities entering the market over a period of time and then extrapolated from this to arrive at estimates for the whole year. Another difference could be due to the different years estimates were made, further compounded by the fact that fruits and vegetables are subject to weather fluctuations and the conditions prevailing in the year of study.

2.3 Consumption of Various Foods, Including Fruits and Vegetables in Nairobi.

The population of Nairobi was projected to be 927,000 people in 1978, growing at an annual rate of 7.75 percent (3.05 percent due to natural increase and 4.70 percent due to migration from the rural areas).[1] The mean household size is 5.4 persons, but the age distribution was not estimated.[2] The mean household income in 1977 was estimated at K.Sh 989 per month or roughly U.S. $120. Food purchases for the same period accounted for 36-45 percent of all household expenditure.[3]

As one would expect of low income groups, most expenditure on food is allocated to cereals. Table 2.9 shows ranking of food groups by expenditure in Nairobi, with estimated percentages. Cereals account for more than one-fifth of all food expenditures, and if one includes bread under cereals, the proportion rises to about one-fourth. Meat and fish are the next most important group, followed by milk and eggs. If we include roots to cover the commodities of this study, then fruits and vegetables would account for about 18 percent of total food expenditures when taken as a group.

It was not possible to estimate per capita consumption in quantities from the data presented so far, but taking the highest and

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[1] Nairobi Urban Study Group, Nairobi Metropolitan Growth Strategy, Vol. 2, Technical Appendices, Nairobi City Council (1973).

[2] Central Bureau of Statistics, Urban Food Purchasing Survey 1977, Part 1, Ministry of Finance and Planning (Kenya, 1978), p. 18.

[3] Ibid., p. 37.

Table 2.9 Ranking of Food Groups, Monthly Expenditure (in K.Sh) and Percentage of Total Food Bill, Nairobi, Kenya, 1977.

Food Group	Rank	Expenditure (K.Sh) per month	% of Total Food
Cereals	1	91	21.26
Meat and Fish	2	74	17.29
Milk and Eggs	3	65	15.19
Beans and Vegetables	4	47	10.98
Sugar	5	36	8.41
Fats	6	32	7.48
Bread	7	26	6.07
Beverages	8	19	4.44
Fruits and Nuts	9	17	3.97
Roots	10	12	2.80
Others	11	9	2.10
Total	-	428	99.99

Source: Adapted from: Republic of Kenya, Central Bureau of Statistics Urban Food Purchasing Survey, 1977. Part 1.

lowest estimates of total quantities marketed in Nairobi from Table 2.8, it appears that per capita consumption would lie somewhere between 41.39 kg. and 68.76 kg. per annum. This shows that, although fruits and vegetables may not be very dominant in terms of value, in quantitative terms they are an important food item. Per capita consumption in quantitative terms for other food items were not available to enable further comparisons to be made. In the next chapter, it will be shown that the marketing of fresh fruits and vegetables in Nairobi employs a considerable number of people. Although it was not possible to estimate the total number of people engaged in the production of fruits and vegetables, it is apparent that, in terms of contributing to the food needs of the population and offering employment opportunities (in transportation, handling and marketing), fruits and vegetables are an important food group to study.

CHAPTER III

THE MARKETING SYSTEM IN KENYA AND THE ORGANIZATION AND STRUCTURE OF THE MARKETING SYSTEM FOR FRUITS AND VEGETABLES

Introduction

This chapter describes the organization of the agricultural marketing system in Kenya and the institutions involved. The discussion then narrows down to the marketing of fruits and vegetables from the farm to the consumption centre in Nairobi, and the structure of the marketing system. For fruits and vegetables, it was found that most of the marketing institutions combined more than one marketing function. It was therefore necessary to describe the marketing system in stages rather than by function or by the institutions involved.[1] The stages involved were from the farm to the local market, from local market to wholesale market, and from the wholesale level to the retail level. In addition, the facilitating functions of grading and standardization were discussed separately, while the structural variables of barriers to entry and concentration levels were discussed on an institutional basis.

3.1 The Agricultural Marketing System in Kenya

Kenya produces a wide variety of agricultural commodities for domestic consumption as well as for export. It was mentioned in the last chapter that the majority of the people are dependent on agriculture. Every small farm family grows a high proportion of its own food and there is limited specialization in production. Export crops are produced in small quantities as part of the farm business on small farms and it is only on large plantations that specialization is practised. It is the production of export crops and the surplus of food over household consumption needs that enters the agricultural marketing system. The marketing system involves a network for collecting small quantities of produce which is bulked for disposal in the domestic market and for export.

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[1] For various approaches to marketing analysis, see T. Beckman, W.R. Davidson and W.W. Talarzyk, Marketing (The Ronald Press Company, New York). 9th edition, 1973, Ch. 1: and Richard Kohls and David Downey, Marketing of Agricultural Products (The MacMillan Company, New York). 4th edition, 1972, Ch. 2.

3.1.1 Local and National Trade

The centre of local trade in the rural areas is the village or rural marketplace where small quantities of produce are brought on a periodic basis to be sold to traders, or in some cases, to be bartered for other produce. This trade is primarily for the needs of the rural areas and encourages some degree of specialization in small holder production. The surpluses from the rural markets, and export crops without any local demand move to the urban areas and to overseas markets. The transfer of these surpluses from the rural markets is either through private trade cooperatives or marketing boards.

3.1.2 Private Trade

Some agricultural products for domestic consumption and some for export are handled through private trade. Domestically consumed commodities that move through private traders include potatoes, beans, peas, bananas, cabbages, poultry and eggs. Some products move from local markets through wholesalers, some to processors and then to wholesalers and retailers before reaching the final consumer. Some export agricultural products move entirely through private trade to the export markets. Such commodities include fruits and vegetables, and hides and skins, but the majority of products move through cooperatives and marketing boards.

3.1.3 Cooperative Marketing

Cooperative marketing institutions can be divided into large national cooperatives and small farmer cooperatives organized under government auspices. The national cooperatives include the Kenya Cooperative Creameries, the Kenya Planters' Cooperative Union, which handles the processing and marketing of coffee in consultation with the Coffee Board, and the Kenya Farmers Association which, besides being an agent for the Maize and Produce Marketing Board and the Wheat Board, also distributes agricultural inputs nationally.

Some cooperatives, notably the small holder coffee cooperatives, own and operate processing facilities like pulperies. The coffee cooperatives enforce quality standards, but market their produce through the Kenya Planters' Cooperative Union. Cooperatives have problems in the management of their affairs, quality incentives and timing in the availability of inputs for farmers.

3.1.4 Marketing Boards

It was pointed out in Chapter I that Kenya has numerous marketing boards dealing with various commodities. The powers and operations vary between marketing boards. Some marketing boards are responsible for all marketing operations. These include the maize, wheat, beef and pyrethrum boards. Other boards coordinate the activities of private traders or cooperative organizations without directly assuming marketing operations themselves. These include the tea, coffee, sisal and horticultural boards.

Many marketing boards have dominant roles, especially in the pricing of commodities. The maize and produce board has the most rigid control. The board sets prices domestically, but enforcement of produce movements in the country is handled by the police. Many boards appoint agents and processors to supplement distribution of produce in the country. Tight control is exerted on the movement of produce within the country through licensing procedures. Despite the wide powers granted to the marketing boards and the enforcement by the police, there is a significant amount of smuggling and trade outside the control mechanism. Price discrepancies between Kenya and the neighbouring countries of Uganda and Tanzania provide incentives to bypass the board channels, even at the risk of stiff fines and the confiscation of produce. Illegal trading inevitably raises marketing costs through lengthy roundabout journeys, delays and the uncertainty generated.

3.2 Marketing Channels for Fruits and Vegetables

3.2.1 From Farm to Local Markets

Produce leaving the farm was primarily delivered to local markets by farmers using bicycles, vans and light trucks, depending on the distance involved, the size of the load, and the condition of secondary roads. Many secondary roads were often impassable in the wet weather, and produce was carried to the better roads on head loads (especially by women). Once on the better roads, a large proportion of the produce was carried on buses or light passenger vehicles, with each farmer accompanying their individual lots to the local rural market. In some cases, produce traders travelled from farm to farm buying produce which was transported directly to Nairobi. Some farmers living near Nairobi transported their produce directly to the wholesale market using their own or hired vans. For areas of production distant from Nairobi, the typical pattern was to take produce directly to the local rural markets.

On reaching the local market, produce was disposed of in one of several ways: a) the farmer assumed the role of retailer and sold directly to consumers in the local periodic market; b) the farmer sold directly to a retailer in the local market; and c) the farmer sold to a local assembler who bulked produce for sale to transporters and traders. In some areas, farmers were organized into cooperatives and all transactions were made on behalf of the farmers by elected officials.

3.2.2 From Local Rural Markets to the Nairobi Wholesale Market

Produce was transported to the Wakulima Wholesale Market in Nairobi by road in the majority of cases, though smaller quantities were supplied by handcarts and railway wagons. Table 3.1 shows the percentages of selected types of produce and the means of transport by which they were supplied. The transporters from the local markets in the majority of cases sold their produce to wholesalers outside the Market in Nairobi and only entered the market to unload. However, in a few cases the transporters also acted as wholesalers once inside the Market. In some cases, the wholesalers at Nairobi owned their own trucks and sent them to the local markets with their employees while the wholesalers remained behind to dispose of delivered produce. It was also noticed that produce sometimes changed hands three or four times before entering the wholesale market, indicating some speculative activities or specialization of functions.

Table 3.1 also shows that only bananas and oranges were delivered by rail to the Wakulima Wholesale Market in any substantial quantities. Uganda was an important source of bananas in 1977 and 1978, and the railway line extends all the way from the Kenyan coastal part of Mombasa through Nairobi to Western Uganda. The coastal region of Kenya was an important source of oranges for the Kenyan market and the railway line was used for transporting oranges from the coast.

Table 3.1 Selected Produce Supplied to Wakulima Wholesale Market, Nairobi, 1977-78, by Various Means of Transportation

Produce Type	Trucks and Light Vans (%)	Handcarts (%)	Railway Wagons (%)	Total (%)
Potatoes	85.9	8.8	5.3	100
Cabbage	98.0	2.0	0.0	100
Bananas	75.0	9.0	16.0	100
Green Maize	96.0	3.8	0.2	100
Tomatoes	75.2	24.8	0.0	100
Oranges	61.2	26.6	12.2	100
Carrots	98.0	2.0	0.0	100
Onions	76.2	23.8	0.0	100
$\bar{X}$	83.2	12.6	4.2	

Source: Compiled from Wakulima Market Cess Books, August 1977 to July 1978.

Table 3.2 shows the origin of selected commodities entering the Wakulima Wholesale Market in 1973. Most of the areas of origin of the commodities listed were served by the railway network, but problems of timeliness of availability of wagons, waiting time at the terminal point in Nairobi and the need to have a full wagon load to justify charges, all reduced the utilization of the railway system. Moreover, few wagons were refrigerated and traders felt they could control movements much better by using the road system.

Map 1 shows the districts in Kenya and the ones that were listed as the source of produce. With the exception of Mombasa, all the other districts are part of the Kenya Highlands which receive adequate annual rainfall to support unirrigated agriculture.

Table 3.2 Origin of Selected Commodities Entering Wakulima Wholesale Market, March/April 1973, and Percent Shares.

Commodity	District of Origin	Percent Share
Cabbage	Nyandarua	56
	Kiambu	34
Carrots	Kiambu	100
Green Maize	Kiambu	79
	Nyeri	15
Oranges	Mombasa	33
	Muranga	55
Bananas	Nyandarua	59
	Kisii	33
Tomatoes	Kiambu	38
	Machakos	19

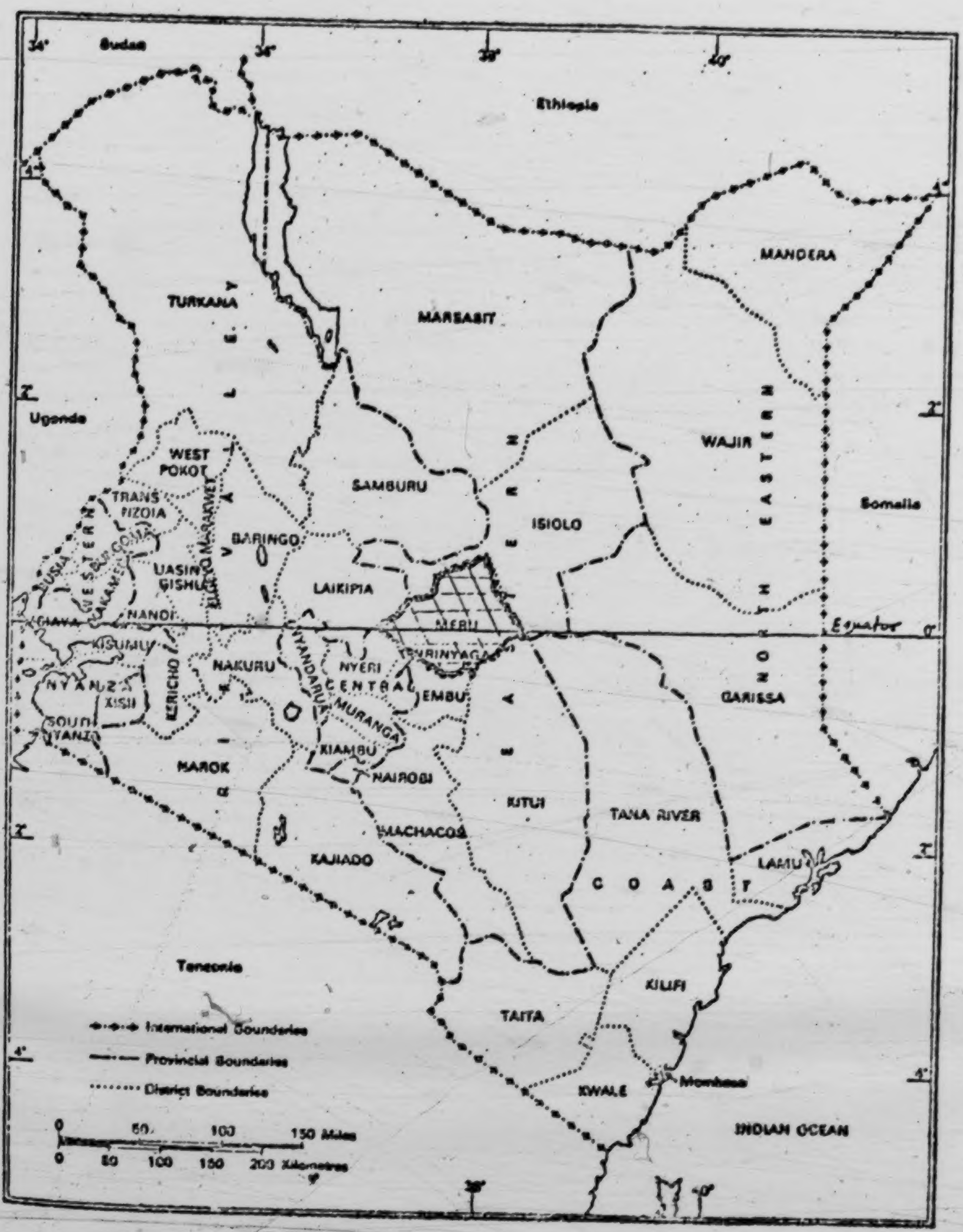
Source: F. Heinrich, Basic Data on the Domestic Horticultural Marketing System in Kenya, (Nairobi, 1972: Berlin, 1975).

3.2.3 From the Wholesale Market to Retail Outlets

Most retailers in Nairobi obtained their produce from the Wakulima Wholesale Market, and visits were made three to four times a week or as the need arose. Retailers of fruits and vegetables generally bought from a large number of suppliers and no permanent relationships were reported. Each purchase was essentially "new" and was negotiated mainly on price and quantity terms. Most purchases were made in cash, and only one retailer reported receiving goods on credit on a regular basis.

Retailers transported produce to business locations within the city by road transportation. The larger retailers had their own vehicles or hired light vans, but such retailers were few in number. Retailers within a four kilometer radius utilized handcarts which were always

Map 1 Map of Kenya. Sources for Fruits and Vegetables


Sudan
Ethiopia
TURKANA
MARSABIT
MANDERA
WAJIR
SAMBURU
ISIOLO
Somalia
Uganda
WEST POKOT
TRANS NZOIA
BARINGO
UASIN GISHU
LAIKIPIA
NANDI
MERU
KISUMU
NAKURU
NYERI
CENTRAL
EMBU
KIRINYAGA
KERICHO
KISII
NYANZA
SOUTH NYANZA
MURANGA
KIAMBU
NAIROBI
NYANDARUA
GARISSA
NAROK
KITUI
TANA RIVER
MACHAKOS
KAJIADO
LAMU
COAST
Tanzania
KILIFI
TAITA
KWALE
Mombasa
INDIAN OCEAN
WESTERN
RIFT VALLEY
EASTERN
NORTH EASTERN
Equator
International Boundaries
Provincial Boundaries
District Boundaries
0 50 100 150 Miles
0 50 100 150 200 Kilometres

available around the market for a negotiated fee on piece basis. A good number utilized public buses for transportation of merchandise around the city. The predominant arrangement, however, was for retailers within the same locality to pool resources together and hire a light van which made deliveries to their respective places of business. It was noticed that there were specialized light transporters who had a close relationship and working knowledge of retailers' needs and working areas, who were always at hand. The transport business seemed competitive as to rates and conditions around the city, but this aspect was not studied to any great extent. Figure 3.1 summarizes the flow of produce from the farm to the urban consumption centre.

3.3 Some Facilitating Functions: Grading and Standardization

This section describes the type of units utilized in the selling and buying of fruits and vegetables in Nairobi and the effects these had on the performance of the marketing functions. Farm products vary in quality depending on growing conditions and must be sorted and graded. At the retail level, the very act of buying involves grading, however subjective the grading might be. At the retail level, there is market "transparency", insofar as it is possible to inspect all produce before buying. At the wholesale level in Nairobi, produce was transported by jute bags which precluded inspection of anything but the top layer of produce, and there was no assurance that the top sample was representative of the total.

3.3.1 Importance of Grading and Standardization in Marketing

Grading is defined as "the subdivision of a product into classes which vary in acceptability to a significant group of buyers."[1]

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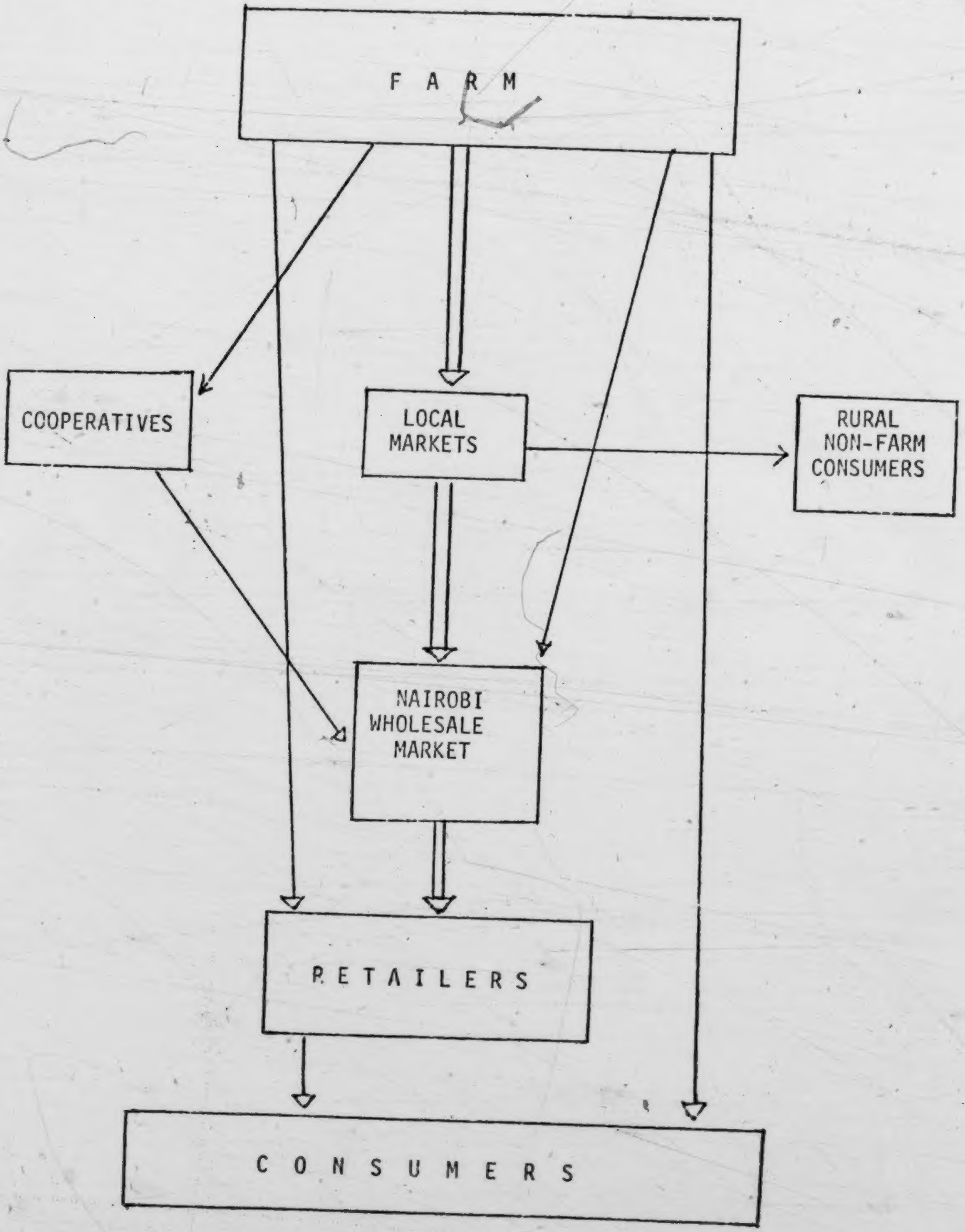
[1] Doll, Rhodes and West. Economics of Agricultural Production, Markets, and Policy (Richard D. Irwin, Homewood, Illinois, 1978), p. 398.

Figure 3.1 Flow of Fresh Produce from Farms to Nairobi, 1978.


FARM
COOPERATIVES
LOCAL MARKETS
RURAL NON-FARM CONSUMERS
NAIROBI WHOLESALE MARKET
RETAILERS
CONSUMERS

A standard is a measure generally recognized as having a fixed value. "Standardization then involves the determination of basic measures or limits known as standards."[1] In discussing grading and standardization, the present discussion will be limited to weights and measures (standards) and to the packaging methods used and their impact on market transactions.

Standardization in a marketing system makes the exchange function more economical and might indeed make it possible. Standardization cuts down the necessity of "sale by inspection", which is a time-consuming process. Standardization can be done by sale, by sample, or by description. Sale by sample involves inspection of the sample, to which the entire lot is expected to conform. Sale by description can be conveyed by word (printed or oral) or by blueprints.

Standardization facilitates the exchange function in other ways. Market news and arbitrage tied to specific grades are a helpful guide to market allocation. Grades facilitate price differentiated marketing, with premiums received for more desirable grades. Eventually, this feeds back to producers, encouraging production of higher quality produce. Assuming that grades reflect consumer preferences, grading can increase consumer satisfaction by separating the choice set into different classes. The consumer then buys the specific class which best suits his needs without buying the whole set as a bundle. It is this separation of the choice set into different classes that is important in a grading system. Grading can lead to lower procurement costs if undesirable merchandise is eliminated at source and would not have to be handled and transported over long distances. Specialized operations such as processing and distribution are made easier by grading in that products with the same desirable characteristics can be bulked for the same end use. Grades, if they also discriminate on the basis of price, can broaden end uses, for example, lower grade produce (and hence, lower priced) can be used as processed products or as feedstuffs.

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[1] Beckman, et al., Ibid., p. 500.

3.3.2 Some Units Used in the Market System in Nairobi

Produce in the wholesale market was delivered in jute bags, boxes, or by the bunch. Potatoes were delivered in bags, as were maize, oranges and cabbages. Tomatoes, which are more delicate, were delivered in boxes, as were lettuce and some fruits. Cooking bananas were delivered by the bunch.

At the retail level, commodities were sold by volume with a "debe" (empty edible oil tin), some by weight and some by lot. Table 3.3 shows the net weights of various units of sale for selected commodities used at the wholesale market.

3.3.3 Some Effects of the Diverse Units Used in the Wholesale Market

It is clear that the units used in the wholesale market were extremely diverse. No standardization was observed and it was apparent that commodities were packaged in whatever material or container was available. (This might be considered recycling of some type, since materials were put to end uses for which they were never designed.) The unstandardized units led to some inefficiencies in the exchange function. First, buying and selling took a long time; every prospective buyer had to compare prices quoted on the basis of a "large box", "small box", or whatever other unit. Weights had to be estimated subjectively in order to determine the best price offered. On average, retailers

Table 3.3 Net Weights of Sale Units for Selected Commodities Traded in Wakulima Market, 1975. (In Kg.)

Commodity	Unit	Mean Wt.	Minimum	Maximum
Potatoes	Bag	106.1	96.0	121.0
Cabbages	Bag	90.0	79.0	105.0
Maize	Bag	132.6	113.0	152.0
Bananas	Bunch	14.9	9.0	31.6
Tomatoes	Small box	9.8	8.5	14.0
Tomatoes	Ordinary box	26.6	22.5	33.0
Tomatoes	Medium box	38.5	34.5	43.5
Tomatoes	Large box	79.5	73.0	88.0
Oranges	Bag	71.3	53.0	87.5
Oranges	Crate	54.9	47.5	64.0
Oranges	Box	35.2	32.0	40.5

Source: Adapted from L. Maritim, Analysis of Produce Flows to Wakulima Wholesale Market, Dept. of Agric. Economics, University of Nairobi (1977).

reported that they spent three hours in the wholesale market buying up stocks, and it was necessary to open up the market at 4.00 a.m. every day. Besides establishing the best quality to buy, buyers in the wholesale market had to spend time subjectively sizing up individual loads for favourable weight differences, and all transactions had to be effected by inspection.

The units and packaging materials used at the wholesale market were found to be ill-suited for physical handling of produce. There was no mechanical loading or unloading of produce at the wholesale market, and all operations had to be done by hand. Table 3.3 indicates that bags of potatoes and cabbages weighed about 100 kilograms, making physical lifting and moving an exerting task. To cut down on the drudgery involved, many traders simply dumped their loads from the back of the truck. Some produce became so bruised that it had to be discarded.

Broken oranges, potatoes and other produce were scattered all over the market floor and a large staff was employed on a permanent basis for sweeping and cleaning up. One whole corner of the market was reserved for discarded produce, and at one time the heap of garbage was up to ten metres high. Physical wastage was contributed to by the containers themselves. In a hot climate, produce that is tightly bundled up rots rather fast. Green leafy vegetables give off moisture, encouraging bacterial growth and, hence, rapid quality deterioration, all adding up to the losses incurred through rough handling. It was estimated that up to thirty tons of garbage was swept out of the wholesale market every week.

The characteristics of packaging materials also encouraged the delivery of substandard produce. A bag of potatoes or cabbages is normally open just at one end and short of spilling out all the contents, one can only inspect the top layer. Facilities for produce examination were not available, which encouraged the "padding" of bags and boxes with substandard produce. At the farm level, farmers were paid for their produce according to the number of bags delivered (in lieu of weight). The possibility of detecting a "padded" bag or load all along the line was limited, and this no doubt encouraged filling bags with excessively leafy and rotten produce in the bottom and middle layers of a bag, with prime produce concentrated at the top. A casual inspection would pass such a load since the real contents would not be discovered unless the whole lot was first emptied out. The retailers, who had eventually to break bulk for household sales, bore the brunt. In some cases only one-third of the contents of a bag were saleable, and any losses incurred were borne by the retailers. One would expect, though, that the producer ultimately bears the loss because all produce buyers expect a certain amount of padding and discount the price to all sellers according to the probability involved. It would be to a farmer's advantage to demonstrate that his produce is all good.

3.4 Market Structure

Market structure is defined as "those characteristics of the organization of the market which seem to influence strategically the nature of competition and pricing within a market."[1] The main elements of market structure are:[2] seller concentration, barriers to entry of new firms, growth rate of market demand, price elasticity of market demand and buyer concentration. Market structure at the wholesale and retail levels is discussed on a commodity basis in terms of seller concentration and barriers to entry.

3.4.1 The Wholesale Level

3.4.1.1 Concentration Levels

Table 3.4 presents the number of firms identified dealing with each commodity, the average four-firm concentration ratio (CR_4) per week based on the quantity of shipments, and the percentage ranges of CR_4. Every delivery entered separately in the market books was assumed to have been made by a separate firm. This was considered reasonable in light of the findings of previous studies. Maritim[1] and Lorenzl[2] found that nearly 70 percent of all wholesalers entered the market once a week and that only 17.3 percent visited the market twice a week. This was found to be a good approximation of the CR_4, since during this study it was established that the majority of the large wholesalers only delivered produce once a week.

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[1] Joe S. Bain, Industrial Organization (New York: John Wiley and Sons, Inc. 1968), p. 7.

[2] Richard Caves, American Industry: Structure, Conduct, Performance 3rd edition (Englewood Cliffs, N.J.: Prentice Hall Inc., 1967), p. 16.

Table 3.4 Number of Firms, Average Percentage Weekly Four-Firm Concentration Ratios (CR_4) by Shipments, and Ranges of CR_4, for Selected Commodities Traded in the Wakulima Wholesale Market, Nairobi, August 1977 through July 1978.

Commodity	Number of Firms	Average Weekly CR_4 (%)	Range of Weekly CR_4 (%)	CR_4 Rank
Potatoes	81	24.87	8.24-100.00	8
Cabbages	100	35.14	7.16- 93.13	7
Tomatoes	46	55.64	24.39-100.00	5
Oranges	45	65.36	19.95-100.00	3
Carrots	20	77.57	38.50-100.00	1
Green Maize	35	39.71	21.81-100.00	6
Bananas	69	60.13	29.87- 97.58	4
Onions	39	70.16	23.18-100.00	2

Source: Based on data collected for this study.

Carrots, onions and oranges had the highest four-firm concentration ratios. Potatoes and cabbages, which were the major commodities traded in the Wakulima Wholesale Market, were less concentrated than the minor commodites, and also had wider ranges in four-firm concentration ratios.

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[1] L.H. Maritim, op. cit., p. 44.

[2] Gunter Lorenzl, Wakulima Wholesale Market 1974. Unpublished.

The number of firms in the market increased in the months of March, April and May, and then in November and December for all commodities. These were the months following the rainy seasons in many parts of the country and they were also the months when products were more abundant. In other months, the number of firms declined for all commodities. From the number of firms selling each commodity and the average weekly CR_4, one can deduce that even the highly concentrated commodity trades, like carrots and onions, had a sizeable number of firms in the competitive fringe.

3.4.1.2 Barriers to Entry

In industrial organization theory, barriers to entry include absolute barriers to entry such as patents, and exclusive and total resources owned by existing firms. In addition, other barriers include capital barriers to entry, economies of scale and product differentiation. Each prospective entrant should evaluate the conditions of entry and the degree of advantage existing firms have over entrants as to product prices and marketing costs likely to be incurred. Decisions to enter are usually based on profits being earned by existing firms, the nature of entry barriers, the possible reactions of existing firms to new market entrants, the likely reactions of other potential entrants, and irreversible costs of gathering and making entry decisions.[1]

For agricultural products in the raw state, product differentiation and patenting are unlikely to be relevant barriers. In discussions with wholesalers and traders, the capital costs of acquiring and running trucks and other vehicles were ranked as the major barriers to entry. No exact capital costs for transportation equipment were obtained, but the costs were high. For example, a one-half ton van in 1978 cost about K.Sh. 50,000, or roughly U.S. $7,000, which included price and duty. For a large truck, the cost would run into several times that, possibly to the order of U.S. $30,000. In a country of low personal incomes and limited access to capital markets by small private entrepreneurs, such capital costs are high barriers to entry. Entrepreneurs could start off with used vehicles or hired ones. Used vehicles had a high resale value, but the possibility of hiring a vehicle existed. It was not established whether rental terms would make hiring a feasible alternative.

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[1] R.E. Caves and M.E. Porter, "From Entry Barriers to Mobility Barriers," Quarterly Journal of Economics, Vol. 91 (1971), pp. 241-262.

Conduct barriers to entry were evaluated by informal discussions with market participants. Specifically, market participants were asked to relate their experiences and the cooperation or otherwise they had received from other firms in the market. The majority reported neutral reactions to their entry into a market place, but some reported intense price competition when they tried to penetrate established firms' supply areas. The banana trade in one district was said to be controlled by four firms who kept other traders out with threats of violence, but this was not substantiated. On the whole, no formal evidence was uncovered of cartels or informal structural arrangements.

3.4.2 The Retail Level

3.4.2.1 Classification of Retail Outlets

Several types of retail outlets were identified in the market chain for fruits and vegetables. The distinguishing characteristics were found to be the variety and mix of merchandise handled, size and type of retail premises, legal status and operating hours. A brief description of each follows.

a) Green Grocers:

As the name implies, Green Grocers specialized in fruits and vegetables only, handling both local and imported produce (such as grapes and apples). They operated from permanent, well serviced premises in the central district area, or in shopping centres in high income residential areas. Ten Green Grocers were identified in Nairobi in 1978 and, on average, each employed five people. Green Grocers had a regular, highly selective clientele, usually foreign consumers with high incomes. Specialty items, often imported from temperate climates, were an important trade item. All Green Grocers were licensed and kept regular business hours.

b) City Council Operated "Markets":

The City Council of Nairobi, in addition to running the wholesale market, operated ten retail "markets" and three open air markets. A "market" is a large building under one roof with common light and sanitation facilities. Each "market" was divided into stalls which were individually allocated. The markets had stalls for sale of fresh fruits and vegetables, meat and fish, food, and dry goods such as clothing, sugar, salt, matches and cigarettes and common household goods such as pots and pans.

A regular monthly rental fee was charged, depending on size of stall, the location of the "market" and the type of merchandise one was licensed to sell. The City Council regulated the hours of business and maintained all the premises and required certain standards of sanitation. In all, the city "markets" had two thousand seven hundred stalls, one-third of whom were estimated to deal with fresh fruits and vegetables.

c) Provision Stores:

Provision stores were located in most residential areas and handled all kinds of household goods ranging from fresh fruits and vegetables, dry consumer goods (packeted and tinned), kerosene, patent medicines, liquor retailing, and minor clothing items. Most provision stores were individually operated, but a number were owned by partnerships. The typical pattern was to operate the business from leased buildings. A few operators owned their own premises. All the provision stores were licensed on an annual basis by the district trade and commerce administration. It is estimated that there were about two thousand provision stores in Nairobi in 1978, but not all dealt with fresh fruits and vegetables.

d) Hawkers:

Hawkers were the dominant sellers of fruits and vegetables in Nairobi in 1978. Hawkers operated out of makeshift shelters made of paper cartons, iron sheets or whatever material came to hand. Hawkers were invariably located in empty lots or back streets in residential areas. Some hawkers were licensed by the City Council on an annual basis, but the majority were not and were subject to prosecution and confiscation of merchandise when caught. No premises used by hawkers had running water or electricity and most were commonly burnt down (and immediately rebuilt) by city health inspectors as health hazards. Some hawkers were licensed to operate out of handcarts in a specific location, but this regulation was commonly violated since it was found to be rather restrictive. All businesses run by hawkers were one person establishments and rarely hired any laborer. The businesses were usually open for up to sixteen hours per day.

e) Open Air Markets:

There were several open air markets in and around the city of Nairobi, varying in size of patronage and frequency of operation. The open air markets consisted of fenced open areas, for which a nominal fee was charged for entered produce. Some markets operated on a daily basis, while others were open three times a week. Different kinds of products were offered, but in all cases fresh fruits and vegetables were dominant. No space was allocated to any individual and no license was necessary to operate in these markets, so long as the entry fees were paid. There were no services provided (e.g., water and sanitation) except for the removal of garbage. It was not possible to study these markets to any extent because few sellers attended on a regular basis.

f) Itinerant Vendors:

Trade of unknown magnitude was carried out by itinerant vendors who peddled their produce from door to door in residential areas, and occasionally in work places such as banks and factories. Itinerant vendors carried their merchandise for sale in baskets and moved from house to house, usually shouting in a sing-song voice advertising their presence and their wares. Itinerant vendors received less attention and wrath from the city administration than hawkers and were largely left alone unless they created a disturbance. It was not possible to estimate the number of itinerant vendors.

3.4.2.2 Some Structural Features of Retail Outlets

The information provided here will deal with certain features of Green Grocers, provision stores, hawkers and City Council Markets. These were the retailers who operated from fixed premises or points of business and could be studied over a period of time. It was not possible to provide any meaningful information about itinerant vendors and open air markets.

Table 3.5 presents information on size of sales area in square feet, years in the same business, starting capital, estimated sales, labour engaged and hours of operation per week.

Table 3.5 Computed Means of Selected Features for Four Types of Retail Outlets in Nairobi, 1978.

Selected Feature	Green Grocers	Provision Stores	Hawkers	City Markets
Sales area in sq. feet	412.5	460.3	126.0	80.0
Years in present business	5.80	6.14	2.97	9.50
Initial Capital, KShs.	27,500	14,640	516	260
Monthly rental for premises,KSh.	2,250	507.0	-	104.5
Estimated Weekly Sales (Kg.)	1,298	1,026	800	950
Weekly Sales.Sq. ft. (Kg.)	3.15	2.23	6.35	11.88
Number of People Engaged	4	2.47	1.0	1.5
Hired	2	1.87	0	.5
Self and Family	2	.6	1	1.0
Weekly Sales per person (Kg.)	324.50	415.38	800.00	633.33
Hours of Operation/Week	65	83.5	84.5	78.50
Sample Size	2	15	29	21

Source: Computed from Survey Date, 1978.

Provision stores had the largest sales area, followed by Green Grocers, hawkers and City "markets". Of the business operators interviewed, stall owners in City Council markets had stayed longest in the same business, followed by provision store owners. Hawkers had the shortest stay in the same business with an average of 2.97 years. Hawkers are members of the so-called "informal sector"[1] who include, among others, tailors, smiths and artisans in various trades that largely escape the "net" of official statistics. It has been observed elsewhere that the informal sector is the initial absorbent of migrants from the rural areas before they go on to other occupations.[2] This may explain the short stay of hawkers in the same business as compared to other types of retail outlets.

Green Grocers required the largest amount of initial capital, with an average of K.Sh 27,500, and the City Council market stall owners requiring the least at K.Sh 260. From the brief description on the basis for classification, the large starting capital for Green Grocers was as expected since they operate in high income residential areas and the central business district, and often handled imported produce. It was expected that hawkers would need the least starting capital, but City Council market stall owners required less. This slight anomaly might be explained by the longer stay in the same business by City Council stall owners and the changes in the nominal value of money over time. No deflator was used.

Green Grocers, on average, hired more labour than the other types of retail establishments, while hawkers hired no labour at all.

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[1] The term "informal sector" was first introduced by Keith Hart in his study in Ghana; see Keith Hart, "Informal Income Opportunities and Urban Employment in Ghana," Journal of Modern African Studies (London, March 1973), pp. 61-89.

[2] See Heather, Joshi, Harold Lubell and Jean Mouly, "Urban Development and Employment in Abidjan," International Labour Review, Vol. III, No. 4 (April 1975), pp. 289-306.

Hawkers had the highest weekly sales per person and their sales per person were about 20 percent higher than City markets, the next highest. Hawkers and provision stores operated longer hours per week with 84.5 and 83.5 respectively, than Green Grocers and City markets with 65 hours and 78.5 hours per week respectively. It should be further pointed out that only City markets had strictly enforced hours of operation.

3 4.2.3 Barriers to Entry at Retail Level

Barriers to entry at the retail level were of three types: capital requirements, legal barriers to entry and competition from established retailers. Entry into the Green Grocery type of outlet required the most capital in the form of buying out or setting up new businesses, rental fees, equipment and inventory. Green Grocers were located in either high income residential areas or in busy business areas where rents were high. No Green Grocers owned the retail premises they operated in and the two interviewed (the others were not willing), cited the necessity of paying "goodwill" money to gain preference over other bidders. Provision store operators sold a wide variety of dry goods which also tied up some capital, especially for slow turnover items.

The highest barriers of a legal form were faced by hawkers. It was extremely difficult to obtain a hawking license from the City administration. The City Council was concerned with public health and the particular danger posed by hawkers who operated out of unsanitary premises with no running water or public conveniences. Many hawkers operated illegally and were subject to arrest, confiscation of merchandise and burning of their shanties, which were constructed from paper boards and other highly flammable materials. The City administration maintained a full-time demolition squad and prosecutions were regular. Despite these barriers, it is worth noting that hawkers, both licensed and unlicensed were very prolific.

For City Council markets, securing a market stall was the most important barrier. From discussion with City officials, it was established that for every available stall, there were at least forty applicants, and the process of allocation was time consuming. After meeting whatever criteria were laid down by City officials, the chances of obtaining a stall by secret balloting (the method eventually used), were still less than one in thirty-five. Once a stall was obtained, the only capital necessary was two months' rent. This implies that higher rents and more markets should be considered.

Conclusion

The flow of produce from the farm to the consumption sector in Nairobi was described, together with some market functions that were performed in the process. The structure of the wholesale market varied from week to week for all the commodities, and concentration levels for some minor commodities were shown to be high. The conditions of entry at both the retail and wholesale level were described. In the next chapter, some of the structural variables will be analysed for their impact on the efficiency of the market system, and the empirical models for this analysis will be developed further.

CHAPTER IV

REVIEW OF SOME SELECTED STUDIES AND THE THEORETICAL FRAMEWORK FOR ANALYZING MARKET EFFICIENCY

Introduction

The interactions between economic development and the marketing process have not always been explicitly recognized by economists. For a long time, marketing was viewed as an automatically adjusting process that would respond to production and consumption opportunities, but not as a resource using, signal generating system that has a direct role to play in economic development. In this chapter, studies that highlight this interaction were reviewed. Various approaches for analyzing marketing efficiency were presented, followed by empirical studies on marketing systems or specific commodities. Finally, studies on agricultural marketing in Kenya were discussed separately from studies in other developing countries.

4.1 The Role of Marketing in Economic Development

Agriculture can contribute to an economy's development in five ways: (1) by providing foodstuffs and raw materials to other sectors of the economy; (2) by providing funds for investment (from savings and taxes) to other expanding sectors; (3) by providing a market for other sectors' products; (4) by releasing labour to other sectors; and (5) by earning foreign exchange through exports or through import substitution.

Development is viewed as a process of structural transformation from an economy where agricultural employment and output are dominant, to a point where the labour force in agriculture and agriculture's share in the Gross National Product (GNP) decline. The process of structural transformation is usually framed in dual economy models,[1] which show the interrelationship between agriculture and other sectors of the economy. It is now widely believed that "both in concept and practice it is possible for the agricultural sector to make large net transfers of resources to other sectors. If the transfers are used productively, the rate of economic growth can be accelerated."[2] If there is no agricultural progress, industrial progress will be cut short. The dual economy models emphasize and confirm in formal terms the interdependence between agriculture and other sectors of the economy and the necessity for agricultural progress based on technological change.

The role of marketing in this process of economic development has not always been recognized by economists, or where recognized, it has been assumed to be passive. In the early 1950's, Richard Holton observed that the marketing system was being neglected by planners, and suggested that if market channels were less costly, more goods might flow through them.[3] J.C. Abbott thought the neglect of marketing is possibly a carry over of the classical view that "production is what matters ... consumption is mainly a question of income distribution."[4]

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[1] Notably W. Arthur Lewis, "Economic Development with Unlimited Supplies of Labour," Manchester School of Economics and Social Studies, Vol. 22 (May 1954), pp. 131-191; D.W. Jorgenson, "The Development of a Dual Economy," Economic Journal, Vol. 71 (June 1961), pp. 309-334; and G. Ranis and J.H.C. Fei, "A Theory of Economic Development," American Economic Review, Vol. 51 (Sept., 1961), pp. 533-565.

[2] John W. Mellor, "Accelerated Growth in Agricultural Production and the Intersectoral Transfer of Resources," Economic Development and Cultural Change (Oct., 1973), p. 5.

[3] Richard Holton, "Market Structure and Economic Development," Quarterly Journal of Economics, Vol. 67 (Aug., 1953), pp. 344-361.

[4] J.C. Abbott, "The Development of Marketing Institutions," in H. Southworth and B.F. Johnston, eds., Agricultural Development and Economic Growth (Ithaca: Cornell University Press, 1967), Ch. 10, p. 393.

Collins and Holton noted that marketing firms may not automatically spring up in response to price incentives due to such constraints as lack of grading systems, standard weights and measures and legal framework for contract enforcement.[1] Reed Moyer provided broad perspectives on ways that marketing can contribute to development.[2]

(1) The marketing system can reduce risks by providing information to the participants of the system.

(2) It can provide the organizational framework to coordinate supply and demand and ration supplies in conformity with consumer needs and wants.

(3) The marketing system may generate pecuniary and technological economies as a result of extending the market available to individual firms.

(4) Marketing institutions can be a source of entrepreneurial talent and capital to other sectors of the economy.

(5) The marketing system may draw subsistence producers into the exchange economy.

(6) Marketing institutions can lower consumer costs by improving distribution efficiency through technological innovation, more intensive resource use and less spoilage.

(7) The marketing system can reduce transaction and exchange costs between producers and consumers.

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[1] N.R. Collins and R.H. Holton, "Programming Changes in Marketing in Planned Economic Development," in Carl Eicher and L.W. Witt, eds., Agriculture in Economic Development (McGraw-Hill, 1964), pp. 359-369.

[2] Reed Moyer, "Marketing in Economic Development." Occasional Paper No. 1 (East Lansing, Institute for International Business Studies, Michigan State University, 1965), in Harold Riley, et. al., Food Marketing in the Economic Development of Puerto Rico (Latin America Studies Centre, Michigan State University, 1970), p. 28.

Charles Slater,[1] using a general simulation model, demonstrates how the marketing system can contribute to four goals of development, viz., an increase in real income, a decrease in the share of total income spent on food, a redistribution of income to the lower strata of the population and a reduction in the rate of population growth to levels consistent with the other three objectives. The model used includes, among other things, horizontal and vertical coordination in marketing, nine production and distribution sectors linked with input/output coefficients, subsets of urban and rural consumers of different income, employment and consumption propensities, capital formation and government activities in the economy. The simulation model demonstrates that income can be redistributed to the lower half of the population and employment increased by marketing intervention.

Vincent, after an analysis of the contribution of the marketing system to economic development, notes that resources may actually need to be increased in the marketing system.[2] Other economists have noted the relationship between the goals of development and the structure, conduct and performance of the marketing system.[3] The foregoing analysis

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[1] Charles Slater, "Marketing ... A Catalyst for Development," in Dov Izraeli and Dafna Izraeli and F. Meissner, eds., Marketing Systems for Developing Countries (Toronto: John Wiley and Sons, 1976), pp. 3-17.

[2] C.D. Vincent, "Marketing and Economic Development," in T.K. Warley, ed., Agricultural Producers and Their Markets (New York: Augustus M. Kelly, 1967).

[3] S.D. Neumark, "Economic Development and Economic Incentives," South African Journal of Economics, Vol. 26 (March, 1958), pp. 252-268; P.F. Drucker, "Marketing and Economic Development," Journal of Marketing, Vol. 22 (January, 1958), pp. 252-259; W.F. Mueller, "Some Market Structure Considerations in Economic Development," Journal of Farm Economics, Vol. 41 (May, 1959), pp. 414-425; G.L. Mehren, "Market Organization and Economic Development," Journal of Farm Economics, Vol. 41 (Dec., 1959), pp. 307-315; and W.W. Rostow, View From the Seventh Floor (New York: Harper and Row, 1964), p. 136.

analysis shows that marketing is no longer viewed by economists as a passive and automatically adjusting process, but is a system whose contribution must be planned for in any development effort.

Economists are concerned with the efficiency of the marketing system for several reasons. First, the forces of the marketing system generate price signals which guide investment and consumption decisions. These decisions are optimally made in response to market opportunities and market pressures. Prices direct the allocation of resources and if the market is not working efficiently, these signals will be distorted. Market generated prices, in their most neutral form determine intersectoral income flows and capital formation. Secondly, economists are interested in the concept of efficiency since efficiency explains increased output of goods and services where no additional resources have been brought into use. Economic efficiency has two components: pricing and technical efficiency. Pricing efficiency refers to the allocation of resources according to marginal criteria. Technical or operational efficiency focuses on reducing the costs of moving goods and services through the marketing channels.[1] These two conditions are necessary for economic efficiency, which cannot be achieved without both of them.[2] Thirdly, economists are concerned with dynamic efficiency, which deals with satisfying changes in consumer demand and technical changes in the performance of market functions. Market imperfections that obscure the nature and magnitude of these changes will inhibit adjustments in the market system through time.

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[1] Martin Kriesberg, "Marketing Efficiency in Developing Countries," in Izraeli, et. al., eds., Marketing Systems for Developing Countries, (Toronto: John Wiley and Sons, 1976), pp. 18-29.

[2] Pan A. Yotopolous and J.B. Nugent, Economics of Development: Empirical Investigations (New York: Harper and Row, 1976), Ch. 5.

4.2 Marketing Efficiency: Two Basic Components

Marketing is primarily concerned with the creation of place, time, form and ownership utilities. A market system involves the physical movement of goods from producers through middlemen to the final consumers. As such, marketing utilizes resources to provide services. If the value of the resources used and the value of the services provided were known, a ratio of output to inputs would provide a measure of productivity. An increase in this ratio between two periods would respresent an improvement in the efficiency of the market process. There are difficulties associated with such a measure. Some inputs produce a stream of services, and last over several production periods, while others are consumed immediately.[1] Change in efficiency brought about by substitution of capital for labour introduces another difficulty. Efficiency measured as a ratio of output to the inputs used may rank firms differently if different factors are used. For example, a firm may rank high when labour input is used and rank low when the output to the capital input ratio is used. Output to input ratios are not the only indicators in efficiency that economists are interested in. Particular systems may be associated with a particular set of prices, and since prices are the allocators of resources in a market economy, pricing efficiency is as important as efficiency in the production process itself.

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[1] See R.G. Bressler and R.A. King, Markets, Prices and Interregional Trade (Toronto: John Wiley and Sons, Inc., 1970), Ch. 21.

The two basic components of market efficiency can be demonstrated by using the two input/single output case.[1] Figure 4.1 represents two factors and one output. SS' can be regarded as the efficient isoquant, since it represents the smallest quantity of factor 1 that can be used to produce a given level of output, as factor 2 is varied. All points on SS' and above it are attainable, but points between SS' and the origin are not attainable. The curve SS' represents a level of output that can be produced by various combinations of factors 1 and 2. In Figure 4.1, two firms, Q and P, produce the same output using the same proportions of factors 1 and 2. Firm Q produces the same level of output with only 0Q/0P as much of each factor as the firm at P. Firm Q is, therefore, more technically efficient than firm P. The level of technical efficiency of the firm at P can be measured as:

$$\text{technical efficiency} = \frac{0Q}{0P} \times 100$$

This measure of efficiency is purely physical, since prices of inputs have not been considered. Line AA' represents the ratio of the relative prices of factors 1 and 2. AA' is tangent to the isoquant SS' at point Q'. The firm at Q' is price efficient, since the marginal products of factors 1 and 2 (or their ratios), equals, respectively the prices of factors 1 and 2, or their ratios. The cost at Q' is the same as at R. The price efficiency of the firm at Q can be expressed as:

$$\text{Price efficiency} = \frac{0R}{0Q} \times 100$$

Price efficiency and technical efficiency can be combined to obtain a measure of economic efficiency:

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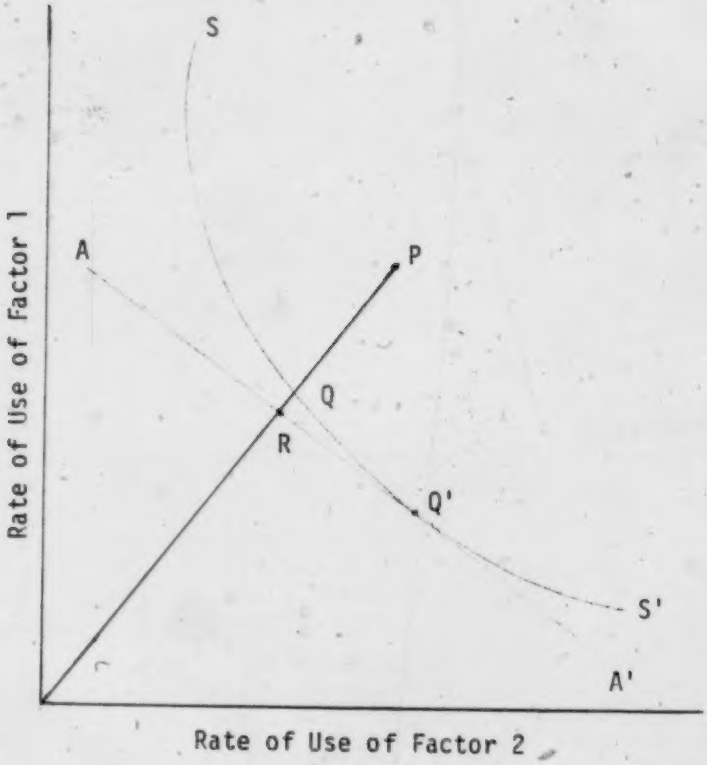
[1] This section draws heavily on M.J. Farrell, "The Measurement of Productive Efficiency," as in Bressler and King, Ibid.

Figure 4.1 The Efficient Isoquant



$$\text{Economic Efficiency} = \frac{OR}{OQ} \times \frac{OQ}{OP} = \frac{OR}{OP} \times 100$$

The firm at Q is technically efficient, but price inefficient, and thus economically inefficient. Only the firm at Q' is economically efficient. It is possible to form an index of technical efficiency and an index of price efficiency and the product of the two to obtain an index of economic efficiency, which in a marketing sense, can be called market efficiency. It has been shown that a firm can be technically efficient but not price efficient and vice versa, but to be economic or market efficient, a firm or system must be both price and technically efficient.

4.2.1 Theoretical Framework for Analysing Pricing Efficiency

4.2.1.1 The Perfectly Competitive Model

Economic theory predicts performance theorems based on the classical model of the perfectly competitive industry. A competitive industry is characterized by a large number of buyers and sellers, product homogeneity, perfect factor and product mobility, freedom of entry and exit and perfect knowledge. Further, it is assumed that all participants are economically rational and engage in transactions in the marketplace to optimize given goals. All these attributes are unlikely to be found in their strictest forms in real market situations at the same time. However, they can be used as bench marks to interpret pricing efficiency. Within this framework of a competitive model, pricing efficiency of a market system can be tested by the following efficiency criteria:

a) In a competitive market, no firms or market intermediaries would earn pure profits for long. Firms with market power would theoretically earn pure profits in the short run, but entry would take place until all pure profits were eliminated. Prices charged would be those consistent with long run average costs of production and all firms would essentially be price takers.

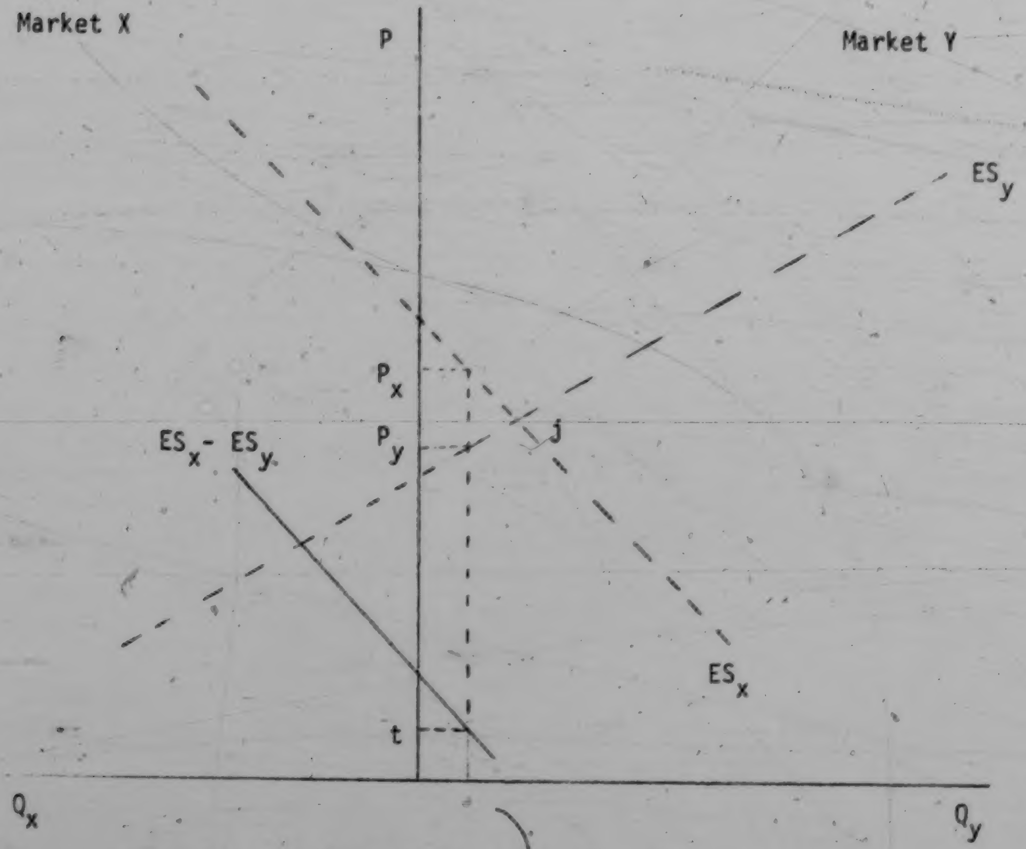
b) Intertemporal price differentials would be those consistent with costs of storage and risk and uncertainty costs of carrying products through time. By computing storage and other costs, price differences between time periods can be compared with each other and should not differ by more than these costs.

c) Prices between spatially separated markets should reflect transfer costs. In a competitive market system, price differentials over and above transfer costs would be eliminated by arbitrage by market intermediaries. Figure 4.2 shows how arbitrage equalizes prices (less transfer costs) between spatially separated markets.

In Figure 4.2, ES_y and ES_x represent excess supplies in markets X and Y (negative for X, positive for Y). ES_x-ES_y represent the effective supply traded. Cost of transfer is represented by t and includes actual cost of transfer, financing, handling and any other expenses incurred in moving goods from market Y to market X. In equilibrium, after arbitrage has taken place, P_x will be the price in market X and P_y in market Y. The difference between the two is exactly equal to transfer cost t. If the difference between the two market prices was greater, then goods would move between the two markets, since market intermediaries would more than cover their costs. If the difference between the two market prices was less than t, then no arbitrage would take place, since any intermediary would lose money in doing business between the two markets.

d) In a competitive market structure prices in spatially separated markets are expected to move in unison in response to stimuli from changing demand and supply. The speed and accuracy of adjustment can be taken as an indicator of close interrelationship and competitiveness between markets. A useful technique is the computation of correlation coefficients between prices in different markets over a period of time. A correlation of 1 indicates perfect unison between markets, and a correlation of 0 shows no relationship at all. In actual market situations, such extremes are unlikely to occur. There are lags in the perception of price differences and in reaction times, so correlation coefficients are likely to be between 0 and 1. The closer

Figure 4.2 Effect of Arbitrage Between Spatially Separated Markets



Source: Bressler and King, Ibid., Ch. 5, p. 91.

to 1 that the correlation coefficients are, the more the interrelationship between markets.

e) The perfectly competitive model predicts that no individual firm has a significant impact on prices; each firm is essentially a price taker. Prices are arrived at by the interactions of supply and demand and any firm attempting to sell above the competitive price will not have any sales, since buyers can always find alternative sellers. Further underlying concepts and methods for testing this proposition will be elaborated later in this chapter.

4.2.1.2 The Industrial Organization Model

The industrial organization model has three components: market structure, market conduct and market performance. Market structure refers to factors that affect the nature of competition in a market. Bain suggests that:

> "Market structure refers to the organizational characteristics of a market, and for practical purposes, to those characteristics which determine the relations of sellers in the market to each other, of buyers in the market to each other, of the sellers to the buyers and of sellers established in the market to other actual or potential suppliers of goods, including potential new firms which might enter the market. In other words, market structure for practical purposes means those characteristics of the organization of the market which seem to influence strategically the nature of competition and pricing within the market."[1]

The main elements of market structure include:

(1) the degree of seller concentration;

(2) the degree of buyer concentration;

(3) the extent of product differentiation;

(4) barriers to entry of new firms;

(5) growth rate of market demand;

(6) price elasticity of market demand; and

(7) the ratio of fixed to variable costs in the short run.[2]

Conduct "refers to patterns of behaviour that enterprises follow in adapting or adjusting to the markets in which they sell (or buy)."[1] The major elements of conduct include:

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[1] Joe S. Bain, Industrial Organization (New York: John Wiley and Sons, Inc., 1968), p. 7.

[2] Bain, Ibid.; Richard Caves, American Industry: Structure, Conduct, Performance (Englewood Cliffs, N.J.: Prentice Hall Inc., 1967), p. 23; and R.L. Clodius and W.F. Mueller, "Market Structure Analysis as an Orientation for Research in Agricultural Economics," Journal of Farm Economics, Vol. 51 (August 1961), p. 516.

(1) methods employed by the firm or group of firms in determining price and output;

(2) the product policy of the firm or group;

(3) sales promotion policy;

(4) means of coordination and cross adaptation of price, product and sales promotion policies among competing firms; and

(5) presence or absence of, and extent of predatory or exclusionary tactics directed against either established rivals or potential entrants.[2]

Market performance refers to the economic results that flow from the industry as an aggregate of firms. Society is concerned with how industry performs in terms of socially desirable goals. The elements of market performance include:

(1) price relative to production costs;

(2) efficiency relative to size, scale and capacity;

(3) sales promotion expenditures as a percentage of production costs;

(4) design, quality and variety of products offered; and

(5) relative progressiveness of the firm in product and technological development.[3]

In the industrial organization model "a principal hypothesis is that market performance may be systematically determined by market structure and market conduct."[1] The direction of causation is assumed to run from structure, and conduct to performance. In reality, all the three dimensions are interrelated in a circular manner and may look like this:[2]

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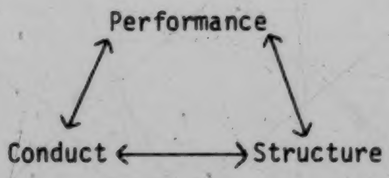
[1] Bain, Ibid., p. 9.

[2] Bain, Ibid., p. 9; Caves, Ibid., p. 23; and Clodius and Mueller, Ibid., p. 517.

[3] Bain, Ibid., p. 11; Clodius and Mueller, Ibid., p. 517.



These concepts do not operate in a vacuum, and one may include the effects of government regulation and the social and political framework within which the industry operates.

4.3 Theoretical Framework for Analyzing Technical Efficiency

Several approaches are used in the estimation of technical, operational or productive efficiency, and they all entail estimation of physical input/output relationships. The approaches commonly used are:

(i) descriptive analysis of accounting data, with point estimates made of average costs.

(ii) statistical analysis of accounting data which involves functional estimation by econometric methods.

(iii) economic-engineering approaches which synthesize production and cost relationships from engineering data.

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[1] Bain, Ibid., p. 41.

[2] Bruce E. Mallen, "A Preliminary Paper on the Levels, Causes and Effects of Economic Concentration in the Canadian Retail Food Trade: A Study of Super Market Power," Food Prices Review Board (Feb., 1976). Mimeographed.

Each of these approaches has advantages and disadvantages which have been discussed by French.[1] The descriptive analysis of accounting data is relatively cheap compared to economic-engineering analysis and is easily understood by plant managers who can relate their experiences to those of others. It has the disadvantage that comparisons between different firms are often hampered by differences in accounting and record keeping procedures. Plant costs are affected by other factors such as management, scale of operations, location and production methods which are not always easy to quantify (i.e., determine the significance of), and any analysis only gives a snapshot of past experience in the firm.

Statistical analysis of accounting has similar data problems to the descriptive analysis: there are different accounting procedures, averaging out costs over accounting periods may conceal important variations in output and capacity utilization and locational or institutional rigidities may conceal variations in prices which may not easily be corrected. Another serious problem is that use of long time series data may obscure technological changes that directly affect cost relationships. Allocation of costs in multi-product firms makes inter-firm comparisons difficult. More fundamentally, however, is that statistical analyis of accounting data is very sensitive to functional specification forms chosen. Stollsteimer, Bressler and Boles[2] demonstrated that by using the same set of data, but varying the specification forms in ways that rested on sound a priori reasoning, "respectable" R^2 and significant regression coefficients were obtained, but whose economic interpretation was not logical.

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[1] Ben C. French, "The Analysis of Productive Efficiency in Agricultural Marketing: Models, Methods and Progress," in Lee R. Martin, ed., A Survey of Agricultural Economics Literature, Vol. 1 (University of Minnesota Press, 1977), pp. 118-151.

[2] J.F. Stollsteimer, R.G. Bressler and J.N. Boles, "Cost Functions From Cross-Section Data: Fact or Fallacy," Agricultural Economics Research, Vol. 13 (July 1961), pp. 79-88.

The most commonly used approach involves estimation of a production function from sampled data to obtain an "average" production function.[1] The average function is used to compare the position of an individual firm relative to the average, or the position of a group of firms relative to the average or the position of a firm or group of firms in different time periods. From the same set of data may be obtained an "efficient frontier" which represents the best available technique actually in use.

Data for the estimation of a production function for the fruits and vegetables sector in Kenya was not available. Valuation of capital equipment in the marketing process was infeasible. Instead, it was felt that physical losses of produce, particularly of perishable commodities represents technical "inefficiency". By using a variant of the "frontier" approach, some estimation can be made of the extent to which losses in the marketing system can be reduced. By discussion with market intermediaries, an estimate of physical losses in the marketing system was made. The lowest such losses suffered was taken as a frontier of the technically feasible efficiency level. The costs and benefits of achieving this feasible efficiency level were estimated.

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[1] C. Peter Timmer, "On Measuring Technical Efficiency," Food Research Institute Studies, Vol. IX, No. 2 (1970), pp. 99-171.

4.4 Review of Literature on Marketing in Developing Countries.

Studies on marketing in developing countries can be divided into two broad categories: 1) studies whose main thrust is to highlight the interactions between economic development and the marketing process, and 2) empirical studies on marketing systems or of specific commodities. Empirical studies on marketing systems in developing countries can, for convenience of presentation, be grouped into two categories, depending on the approach adopted. Some studies are descriptive in nature with major conclusions derived in a largely subjective manner, while others are more statistical and analytical in approach.

One of the earliest studies undertaken in marketing in an underdeveloped area was done by Galbraith and Holton in Puerto Rico.[1] This study was based on direct observation of the marketing system; the authors found the attitude of accomodation of competitors ("live and let live") was not conducive to a competitive marketing system. The forces and possibilities of collusion were quite strong. The authors suggested that efficiency could be improved by consumer and retailer education and improvement in chain store operations, consumer cooperatives, central warehouse and dock facilities and promotion of price advertising. The authors noted that excessive atomization and redundancy of distributive institutions was an undesirable disguise for underemployment and was a highly regressive levy on the Puerto Rican consumer. Alice Dewey[2] in her study of peasant marketing in Java, and Leon Hirsch[1] in his study of cane procurement in India, however, found peasant marketing systems conducive to generation of competitive forces. The Javanese system was studied by Dewey in a wider context and showed a functional relationship between patterns of trade and the social and economic structure of the peasant society. The Javanese society, based on nuclear family concepts, did not have mechanisms for enforcing credit and contractual obligations and had to operate on a cash basis; nevertheless, the system showed great flexibility in adjusting to the needs and limitations of a larger economy. Hirsch found that, although the marketing activities were conducted within and shaped by the environmental context, including labour abundance, capital shortages, dietary and caste restrictions, the participants exhibited a high degree of rationality and economic motivation.

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[1] J.K. Galbraith and Richard Holton, Marketing Efficiency in Puerto Rico (Cambridge, Mass.: Harvard University Press, 1955).

[2] Alice G. Dewey, Peasant Marketing in Java (New York: Free Press of Glencoe, 1962).

Several authors have written on imperfections of African marketing systems. The imperfections can be grouped on the basis of their underlying causes:[2] 1) a basic lack of organization; 2) the nature of African society; 3) inadequate demand; 4) inadequate physical and institutional infrastructure; and 5) exploitative activities of middlemen. The Ottenbergs' description of a periodic market in Eastern Nigeria is quoted here:[3]

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[1] Leon V. Hirsch, Marketing in an Underdeveloped Economy: The North Indian Sugar Industry (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1961).

[2] See William O. Jones, Marketing Staple Food Crops in Tropical Africa (Cornell University Press, 1972), p. 6.

[3] Simon and Phoebe Ottenberg, "Afikpo Markets," in P.J. Bohannan and G. Dalton, eds., Markets in Africa (Evanston, Illinois, 1968).

> "One hears from a distance of up to a mile, the muted roar of thousands of voices, which steadily increases in volume as one approaches the market. As he enters, this roar is punctuated by calls of greeting, sudden vociferous outbursts of quarrelling, infants' cries and the honking of lorries and clang of bicycle bells--. The brilliant colours of the African trade cloths, the garish array of plastics that has invaded West Africa and vegetable foods, oranges, bananas, chili peppers, contrast with the uniform dullness of bale after bale of dried fish, mounds of groundnuts, endless rows of yams and basins of rice and beans."

Under these circumstances, one can have an impression of general confusion and of time consuming transactions little related to supply and demand conditions. Units of measurement, even within one market are not necessarily uniform, and arbitrage between markets some distance apart seems difficult and a uniform price for a commodity may not exist within one market.

The imperfections rooted in the nature of African society are supposed to derive from the extended family system enmeshed with reciprocal obligations, which discourages enterprising behaviour since any profits obtained are expected to be communally shared. The lack of skills and commercial attitudes among African traders are often offered by some scholars as explanations for the predominance of foreigners in internal trade. These attitudes are often said to discourage commercial undertakings and as such, African traders are disadvantaged in commerce.[1]

Demand in many African countries is considered inadequate to support an adaptive market organization. The causes of this inadequate demand are to be found in the tendency for self-reliance within the family units, resulting in narrow markets for trading firms. Large firms cannot arrange supplies on a regular and adequate basis. Farmers who produce on a commercial basis cannot find wholesale firms large enough to handle their output and thus we have a situation which introduces circularity and a tendency for self-reliance instead of more use of the marketplace.

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[1] Guy Hunter, The New Societies of Tropical Africa: A Selective Study, as in Jones, op cit.

Inadequate infrastructure in roads and storage and handling facilities means that supply and demand points are not effectively linked, further reinforcing self-reliance tendencies by farmers who cannot plan their production for the market. Supplies to market arrive irregularly and may not coincide with periods of high or reasonable prices, with consequent distrust of the marketplace by farmers.

Middlemen find opportunities for exploitation due to the lack of experience of African traders and farmers. The lack of infrastructure and standardization of trading units gives opportunities for manipulation and cheating of the unwary. Marvin Miracle found strong collusive tendencies in West Africa, sometimes in the form of well organized cartels.[1] He found collusion in the trade of Kola nuts, cattle and palm fruit. Cartels were coordinated by "queen mothers", whose market power was derived from cash advances made before harvest, moneylending, product differentiation and knowledge of sources of supply. Fletcher and Scott also found the market process in less developed countries seriously imperfect and with physical deterioration and waste usually

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[1] Marvin P. Miracle, "Market Structure in the Tribal Economies of West Africa," in Anschel, Brannon and Smith, eds., Agricultural Cooperatives and Markets in Developing Countries (New York: Fredrick A. Praeger, 1969), pp. 120-139.

"present to an unacceptable degree".[1] Alvis and Temu, in their study of the staple food marketing system in Kenya, found certain situations where the market intermediaries were so few that collusion would occur.[2]

Among the statistically oriented studies, the earliest is that of Bauer and Yamey of groundnut buying in Nigeria.[3] The authors found a high degree of correlation between prices received by farmers above the legal minimum price and the number of buyers in nine different market areas. The authors concluded that differences between observed prices in the nine markets studied could be best explained on the basis of differences in the degree of competition, social heterogeneity and differences in the numbers of buyers in each location. Uma Lele analysed marketing of grain in India using spatial and temporal price spreads, costs and margins.[4] Her analysis showed that the markets were working efficiently: spatial differences reflected transfer costs; seasonal price differences reflected costs of storage and that high marketing margins, wherever present, could be explained by transportation bottlenecks and government regulations. Delane Welsch, in her study of rice marketing in Nigeria, showed that marketing margins were small and that the farmer's share of the consumer dollar was about 54 percent.[1]

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[1] J.T. Scott and L.B. Fletcher, "Cooperatives as Instruments of Market Reform: The Economist's View," in Anschel, Brannon and Smith, Ibid., p. 220.

[2] Vance Q. Alvis and Peter E. Temu, Marketing Selected Staple Foodstuffs in Kenya (West Virginia University, Dept. Agric. Econ. and Office of Internation Programs, Morgantown, W. Va., March 1968). Unpublished.

[3] Peter Bauer and Basil Yamey, "Competition and Prices: A Study of Groundnut Buying in Nigeria," Economica, XIX (1952), pp. 31-43.

[4] Uma J. Lele, Working of Grain Markets in Selected States, India, 1955-1958 to 1964-65 (Ithaca, New York: Dept. of Agricultural Economics, Cornell University, Occasional Paper No. 12, U.S.A.I.D. Prices Research Project, 1968).

W.O. Jones, in a study of thirteen agricultural commodities in three African countries (Kenya, Nigeria and Sierra Leone), concluded that markets in these countries had no major structural imperfections which would cause inefficiencies in marketing.[2] Market chains were short and the number of intermediaries between producer and consumer were small. For some commodities, however, there was likelihood that large traders could manipulate stocks to their advantage, and in some cases, some wholesalers had the ability to manipulate prices. Whether this ability was exercised or not is not stated.

The literature reviewed above, both descriptive and statistical, shows that different conclusions were reached concerning market efficiency. These differences could not be entirely attributed to the methodologies used (there were differences within the two broad classifications). Developing countries differ in many aspects that affect marketing. There are cultural differences, climatic, economic and political philosophies that affect economic activities, and it is not possible to generalize on market efficiency in developing countries. Marketing problems in different countries are unlikely to be resolved fully by general prescriptions; programs must be based on particular problem areas as identified by empirical investigations.

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[1] Delane E. Welsch, "Rice Marketing in Eastern Nigeria," Food Research Institute Studies, Vol. VI, No. 3 (1966).

[2] W.O. Jones, Marketing of Staple Food Crops in Tropical Africa (Ithaca: Cornell University Press, 1972).

4.5 Studies on Agricultural Marketing in Kenya

Existing studies on agricultural marketing can conveniently be divided into three categories, depending on their main thrust. First are the studies concerned with the historical development of rural markets and tracing the transition of subsistence tribal economies into a market oriented economy. Such works include the study by LeVine[1] on the Gusii of Kenya, and Manners[2] on the Kipsigis. Second are government related studies and reports of Commissions of Enquiry, mainly related to the marketing of maize and other controlled commodities. These reports are summarized by William O. Jones[3] in the section dealing with Kenya in his book of marketing studies in four African countries. Third are studies documenting existing marketing channels and methods for various commodities in Kenya. Such studies include the Jones study, the study by Alvis and Temu,[4] and the study by Wilson on fruit and vegetable marketing in Kenya.[5]

LeVine's study described the development of exchange markets from the period after the second World War and details other less purely economic functions in tribal markets, especially as a forum to meet friends and relatives, and as a place for setting disputes out of court. Manners' study, like that of LeVine, traces the development of tribal markets as fora for exchange and noted the importance of tribal markets as sources of food to the plantations established by early British settlers.

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[1] R.A. LeVine, "Wealth and Power in Gusiiland," in P.J. Bohannan and George Dalton, eds., Markets in Africa (Evanston, Illinois: 1968).

[2] R.A. Manners, "Land Use, Labour and the Growth of the Market Economy in Kipsigis Country," in Bohannan and Dalton, eds., Ibid.

[3] Jones, Marketing of Staple Food Crops in Tropical Africa, op. cit.

[4] Alvis and Temu, op. cit.

[5] Frank A. Wilson, Some Economic Aspects of the Structure and Organization of Small Scale Marketing Systems: Marketing of Fruit and Vegetables in Kenya, University of Nairobi, Institute for Development Studies, Discussion Paper No. 176 (1973).

Jones traced the evolution of marketing policy from various commissions' reports and government documents. He summarized the arguments in support of statutory monopoly of maize control in Kenya as based on the following proposals:[1]

1) the national economic welfare required that the incomes of large farmers be protected against competition from low cost producers;

2) the national economic welfare required sufficient suppliers of domestically produced maize;

3) small producers grew maize principally for their own use and the amount they produced and marketed was not influenced by the price at which maize could be sold;

4) Kenya was dependent on large producers for a stable supply of maize;

5) African farmers were inexperienced in commercial undertakings and were therefore easy victims of exploitative traders; and

6) If there were many traders, marketing cost would be high, and if there were few traders, they would combine to enjoy excessive profits.

The propositions summarized above were the basis of marketing board policy and legislation from as early as 1920. The measures were passed by the colonial administration to protect the interests of the settler community and assure an adequate marketable surplus of domestic foodstuffs. It is notable that despite frequent attack of these policies by African politicians, these policies were retained by the new African government formed at indepencence in 1963.

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[1] Jones, Marketing of Staple Food Crops in Tropical Africa, op. cit., pp. 205-206.

Alvis' and Temu's study attempted to document and evaluate the marketing of basic staples in Kenya, some of which (like maize) were under the jurisdiction of a marketing board. The authors found that even in board controlled commodities, the "free" market sales may be as much as four times the sales to the board, especially in years of poor crops. The authors reported that farmers, especially small growers, complained of low prices paid by the board and its subagents, inordinately stringent quality requirements and dishonest measures and weights used by the subagents of the board.[1] Alvis and Temu found the marketing system competitive, but in some areas, the number of wholesalers were so few that possibilities of collusion could not be ruled out.

W.O. Jones, in the study of thirteen agricultural commodities in three African countries (Kenya, Nigeria and Sierra Leone), concluded that markets in these countries had no major structural imperfections which would cause inefficiencies in marketing. Market chains were short and the number of intermediaries between producer and consumer were small. For some commodities, however, there was likelihood that large traders could manipulate stocks to their advantage, and in a few cases, some wholesalers had the ability to manipulate prices. Whether this ability was exercised or not was not established.

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[1] Alvis and Temu, op. cit., p. 321.

Wilson's paper on fruit and vegetable marketing in Kenya concentrated on the market system in the major urban areas. The study examined the areas of structure and organization of the trade in fruits and vegetables, transportation, margin analysis, processing, and the role of government and cooperatives. Wilson found that the urban markets for fruit and vegetables appeared to demonstrate a high degree of competition with large numbers of relatively small operators. The efficiency and availability of transportation facilities appeared to influence the flow of produce into consuming areas. Margins for fruits and vegetables could be explained by retailers operating margins, and price fluctuations were tied to the seasonal nature of production. Government regulation in some commodities raised concentration levels in a market system where market concentration was not a major concern.

Three other studies were concerned with the estimation of the quantities of fruits and vegetables flowing through the wholesale market system in Nairobi and were referred to in Chapter III. The main purposes for the three studies were to quantify and identify the channels of produce flows from the rural areas to the consumption sector in Nairobi. These studies were carried out by Maritim,[1] Holsten[2] and Heinrich[3] for various years. Holsten's and Heinrich's studies mainly gathered quantity data and identified the sources of produce without further analysis. Maritim's study, however, went a little further in studying the organization of the wholesale market in Nairobi. Among the major recommendations were the improvement of sanitary facilities, installation of storage and conditioning facilities, reorganization of vehicular flow and the installation of weighing and grading facilities.

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[1] Maritim, op. cit.

[2] Holsten, op. cit.

[3] Heinrich, op. cit.

4.6 Summary

In this chapter, the role of marketing in the process of economic development was discussed and arguments for attention to the improvement of marketing systems presented. Concepts of efficiency in marketing were separated into technical and pricing efficiency, which are both necessary for the attainment of economic efficiency. Finally, studies on marketing systems in developing countries, with the conclusions reached, were examined with a separate section on studies in agricultural marketing in Kenya.

CHAPTER V

METHODOLOGY AND MODELS USED IN THIS STUDY

In this chapter, the commodities selected for this study and the choice of retail market areas were described. The methods of data collection at the wholesale and retail levels were outlined. The approach taken in this study was elaborated upon, together with the models for testing pricing efficiency at the wholesale and retail levels.

5.1 Choice of Commodities and Retail Areas

This study dealt with the marketing of fruits and vegetables in Nairobi. Fresh fruits and vegetables were chosen for three reasons. First, these commodities were free from government intervention (unlike other basic staples like maize, rice and sugar). In this way, the study attempted to evaluate market forces rather than effects of government intervention. Secondly, it was observed that researchers dealing with government price controlled commodities were frequently suspected and mistaken for government price inspectors and information was therefore withheld. By choosing fresh fruits and vegetables, it was easier to establish rapport with market intermediaries. Thirdly, the bulk of fruits and vegetables consumed in Nairobi arrived through one wholesale market, the Wakulima Wholesale Market. It was therefore less difficult to estimate quantities moving through the market, observe the size distribution of market intermediaries and more importantly, the necessity of travel to contact and interview respondents was minimized by working from one major location.

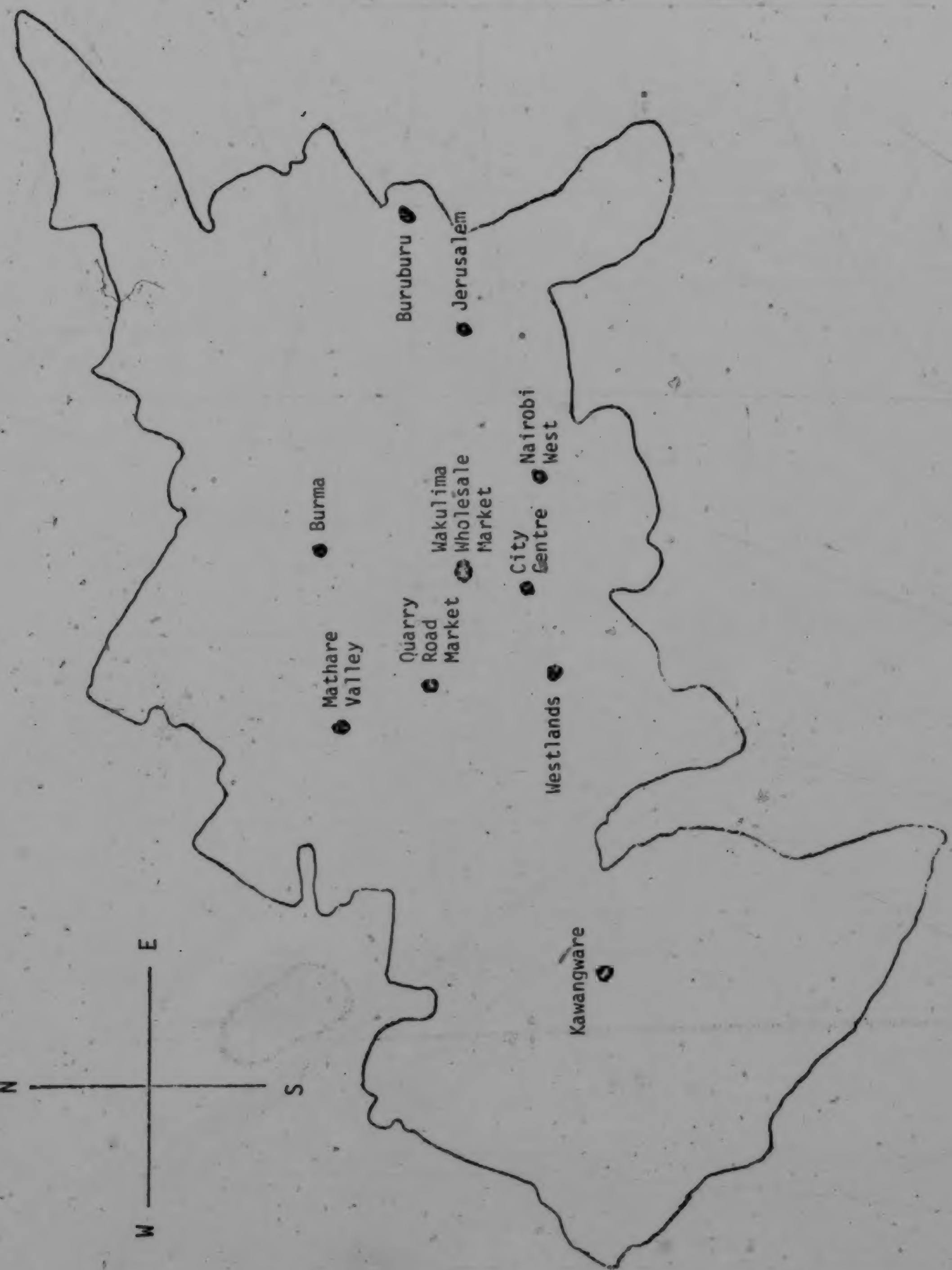
Within the group of fruits and vegetables, the following commodities were chosen: bananas, carrots, cabbages, green maize, oranges, onions, potatoes and tomatoes. These were the major commodities traded at the wholesale and retail levels in Nairobi.

The City of Nairobi was chosen mainly for convenience and for the fact that Nairobi was a dominant market for agricultural produce. Nairobi is the largest urban centre in Kenya and is linked to many rural areas by road and rail transportation. Within the City of Nairobi, nine retail areas were selected. The nine areas chosen were Burma Market, Buruburu Estate, City Centre Retail Market, Jerusalem, Kawangware, Mathare Valley, Nairobi West and Quarry Road Market. The retail areas chosen were sources of food for surrounding residential areas and had at least one type of the five different retail establishments described in Chapter III. Map 2 shows the areas selected.

5.2 Methods of Data Collection

Several types of data were collected at the wholesale and retail levels. For the wholesale level, concentration ratios, quantities moving through the market and prices were required for the selected commodities for a period of one year. Information on prices was maintained by the Central Bureau of Statistics and the Horticultural Crops Development Authority. Information on quantities was collected by going through cess book receipt duplicates. A cess is a fee levied by the City Council of Nairobi on all produce entering the market. On payment of the cess, a receipt was issued, showing the type and quantity of produce, the registration number and type of vehicle used for delivery of produce. Duplicate receipts were maintained by the City Council of Nairobi. The information was maintained on a daily

Map 2 Map of Nairobi. Retail Areas Studied


Buruburu
Jerusalem
Nairobi West
Burma
Wakulima Wholesale Market
City Centre
Quarry Road Market
Mathare Valley
Westlands
Kawangware
N
E
S
W

basis, and from this the weekly four-firm concentration ratios (CR_4) were computed. Using daily quantities to compute weekly four-firm concentration ratios was assumed to be a reasonable procedure because previous studies had established that most traders only brought produce into the market once a week. Table 5.1 shows the frequency of traders that entered produce into the wholesale market in Nairobi as estimated by two previous authors. From the information recorded in the cess receipt books, it was established that computation of the weekly CR_4 from daily data did not introduce any biases because all the large traders delivered produce once a week. It was the smaller traders who made more than one delivery per week to the wholesale market, but none delivered a combined total quantity to get into the top four firms.

Table 5.1 Frequency and Percentage Distribution of Individual Traders Who Delivered Produce to the Wakulima Wholesale Market in Sept. 1974 and March/April 1977.

Times per Week	Sept. 1974[1] Number	%	March/April 1977[2] No.	%
7	00	0	1	.51
6	5	2.00	3	1.52
5	6	2.40	4	2.02
4	20	8.00	10	5.05
3	24	9.60	17	8.59
2	46	18.40	36	18.18
1	149	59.60	127	64.14

Source: 1. L.H. Maritim, Analysis of Produce Flows to Wakulima Wholesale Market, Nairobi, 1977.

2. G. Lorenzl, Wakulima Wholesale Market, 1974.

At the retail level, information on prices, size of establishment, business transacted on an annual basis, extent of physical losses, terms of sale and other information was obtained. However, the retail price series maintained by the Central Bureau of Statistics were found inadequate, since they only dealt with two points in the city. The model used required price information for nine areas and the supplementary information was collected for the period of the study. For the other information referred to above, a structured questionnaire was used on a randomly selected group of retailers. In all, seventy-five respondents were interviewed.

The information on price data needed some adjustment to eliminate biases due to differences in produce quality, varietal differences and differences in types of sales units. To facilitate intermarket comparisons, all the prices needed refer to the same varieties of commodities of similar quality. For potatoes for example, there was a distinction between red and white varieties, and for cabbages there were drumhead and "sugar loaf" varieties. Before price information was collected, retailers and wholesalers were requested to identify various varieties and complete descriptions made of the distinguishing characteristics. Upon comparison of information from various traders, all varieties were found to be uniformly identified except for oranges.

Methods of sale differed from retailer to retailer and between commodities. Some commodities were sold by weight, others by unit, some by lot, while some were sold by volume with a "debe" (empty edible oil tin). A preliminary analysis showed for example, that while the prices quoted by retailers for a kilogram of tomatoes showed very little variation, "effective" prices paid varied a lot. Since the method of sale (by weight, lot, or volume) masked price variations, a scale was bought and all sales were converted to shillings per kilogram basis. Where the retailer did not allow the data collectors to weigh produce, small purchases were made for conversion into weights. This proved unnecessary after two weeks when the retailers understood what the study was all about and were willing to cooperate.

Some parts of the questionnaire required an estimate of turnover on a weekly or monthly basis. Many retailers, although they kept no records, were able to provide an accurate estimate of their sales volume. As a check, however, a subsample of ten retailers was selected and visited each day for two weeks. Each retailer was asked to estimate his/her sales for the previous day, which the interviewer recorded. All stock acquired that day was weighed and the exact weight recorded. The following day the process was repeated. By adding and subtracting over a two week period, an accurate estimate of weekly turnover was arrived at and when compared with the retailer's "guesstimate", an adjustment factor based on all retailers in the subsample was arrived at. In all interviews, an informal approach was adopted, since it was felt this would generate the most useful information. Particular care was taken not to interrupt any sales or customer/retailer dialogue.

5.3 The Approach Used in This Study

The basic concepts of market analysis as developed by Bain were used in this study.[1] The theoretical framework has three elements: structure, conduct and performance. Structure is defined as "those characteristics of the organization of a market which seem to influence strategically the nature of competition and pricing within a market."[1] Conduct refers to the "patterns of behaviour which enterprises follow in adopting or adjusting to markets."[2] Performance refers to the "degree of efficiency of the firms, their progressiveness ... , allocation of resources and product quality."[3]

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[1] Joe S. Bain, Industrial Organization, op. cit.

The application of market structure analysis in developing countries faces some empirical problems. First, very little data are maintained on the traditional market economy and the researcher has to generate his/her own data. Such data therefore do not capture any changing patterns through time and are therefore only valid for the period under study. Secondly, data for evaluation of other performance aspects (such as technological progressiveness, profit rates, levels of output, etc.) are not available.

Despite these limitations, the structure-conduct-performance model can be adapted to traditional market analysis. Through observation of the market system, an evaluation can be made on the number, size distribution and conditions of entry of new firms. Thirdly, by discussion with market participants, one can evaluate the nature of market conduct. By computing costs, margins and price differences in spatially separated markets, one can evaluate market pricing performance, using the predictions of the perfectly competitive as the norm.

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[1] Ibid., p. 7.

[2] Ibid., pp. 9-11.

[3] Ibid., p. 12.

In the models below, the efficiency criteria for each of the structural variables were spelled out, with the expected signs of the estimated coefficients.

5.4 The Models

1) A model for testing pricing efficiency in retail markets.

The model used to test pricing efficiency consisted of computation of correlation coefficients between prices in different time periods in spatially separated markets. Such a model was used by W.O. Jones[1] and by Uma Lele.[2] The model for Nairobi, used with the eight commodities in nine retail areas was set up as follows:

$$\begin{array}{lll} Pt_{1j} & Pt_{1k} \cdots\cdots\cdots\cdots\cdots\cdots & Pt_{1m} \\ Pt_{2j} & Pt_{2k} \cdots\cdots\cdots\cdots\cdots\cdots & Pt_{2m} \\ \vdots & & \vdots \\ \vdots & & \vdots \\ Pt_{nj} & Pt_{nk} \cdots\cdots\cdots\cdots\cdots\cdots & Pt_{nm} \end{array}$$

where Pt_i = retail price for a given commodity in period i.

j to m = location or retail zone.

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[1] W.O. Jones, "The Structure of Staple Food Marketing in Nigeria as Revealed by Price Analysis," Food Research Institute Studies, Vol. VIII (1968), pp. 95-123.

[2] Uma J. Lele, "Market Integration: A Study of Sorghum Prices in Western India," Journal of Farm Economics, Vol. 41, Part II (1967), pp. 147-159.

Correlation coefficients were then computed for the prices in different time periods in the different locations. A correlation coefficient of 1 was taken to indicate perfect unison in movement of prices and a coefficient of zero indicated no relationship at all.

2) A model for testing the influence of the number of sellers on market price.

The industrial organization model predicts that where firms or individuals are few in a market, they become aware of the effect their actions are likely to have on each other. Under conditions of oligopoly, price policies may range over open rivalry, tacit collusion or price fixing and open collusion. The mechanics of price policies under oligopoly are described by Scherer.[1] In the model below, it was assumed that there was no carry over of stock from one period to another. Accordingly, the following model was tested at the wholesale level:

$$P_t = a_1 t + b_1 Q_t + c_1 NS_t + d \text{ Dummy}$$

where $P_t \equiv$ wholesale price at time t

$Q_t \equiv$ quantity flowing into the wholesale market at time t

$NS_t \equiv$ number of wholesale firms in market at time t

$U_t \equiv$ error term

Dummy $\equiv$ a dummy variable to capture any seasonal movement in prices.

a_1, b_1, c_1, d, are coefficients estimated.

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[1] F.M. Scherer, Industrial Market Structure and Economic Performance. (Chicago: Rand McNally Publishing Company, 1970), Ch. 5 and 6.

Since this was a selling operation, the perfectly competitive model predicts that b_1 and c_1 should be negative. The larger the quantity offered for sale, the lower the price, and the larger the number of sellers, the lower the price. If c_1 were positive and significantly different from zero, then it would be concluded that the number of firms had an impact on the selling price.

This model assumed that all traders have equal influence on prices, and if collusion occurs, it would take place between all the sellers. This is not intuitively appealing since collusion may only occur among the dominant sellers, with the smaller sellers on the "competitive fringe" simply cashing in on the situation. Therefore, the dominant traders were explicitly taken account of by including the market share of the top four firms by introducing the four-firm concentration ratio (CR_4), as done below.

3) A model for testing the impact of the number of traders and the effect of the market share of the top four firms.

The following model was used:

$$P_t = a_2 + b_2Q_t + c_2NS_t + d_2CR_{4t} + e\ \text{Dummy} + V_t$$

where P_t ≡ the wholesale price in time t

Q_t ≡ the quantity flowing into the market in time t

NS_t ≡ number of firms in market at time t

CR_{4t} ≡ share of the top four firms in time t

Dummy ≡ a dummy variable to capture any seasonal price movements.

V_t ≡ error term

a_2, b_2, c_2, and d_2 are the estimated coefficients.

On a priori grounds, the coefficients b_2 and c_2 were expected to be negative, as explained above. Since CR_{4t} represented the market share of the four firms (a proxy for market power), we would expect that the higher the market share, the higher would be the price if that power were exercised. If the market power were exercised, we would expect d_2 to be positive and significantly different from zero. It was also possible that the top four firms may have more than a linear effect. Accordingly, the following alternative formulation was tested:

$$P_t = a_3 + b_3Q_t + c_3NS_t + d_3 \sqrt{CR_{4t}} + f \text{ Dummy}$$

where P_t, Q_t, NS_t, CR_{4t} and Dummy are as before and a_3, b_3, c_3, d_3 and f are the estimated coefficients with e_t as the error term. The expected signs of the coefficients were the same.

In the models above, a dummy variable was included to take account of any seasonal movements in prices. Since only one year's price data were used, the usual techniques for deseasonalizing data (for example, the ratio to moving average) were considered inappropriate. The dummy variable was constructed by using rainfall data in districts which were the major sources of commodities flowing into the Nairobi wholesale market. It was estimated that rain falling in one period did not affect quantities and, hence, prices until eight weeks later. For every week there was rainfall, a value of 1 was used eight weeks later, and where there was no rainfall, a value of zero was assigned eight weeks later. There was one rainy period during March, April and May and then another one during October and November.

The dummy variable was not a structural variable and no _a priori_ expectations nor interpretation were attached to the variable in any of the models used.

In model four below, using wholesale and retail levels, no dummy variable was included. It was assumed that prices at both levels were subject to the same seasonal influences. Inclusion of a dummy variable in the model showed no significant differences in the estimated coefficients and was therefore not reported in the results chapter.

4) A model for testing the hypothesis that retailers in Nairobi have no significant influence on prices.

The competitive market model which is the basis for testing most of the hypotheses put forward so far, postulates that in a competitive environment, market participants have no influence on prices and are therefore price takers. Retail prices would therefore merely reflect changes in wholesale prices with a margin to cover expenses, and retain resources in their present use. In Chapter III, it was noted that most retail establishments were small, which implies that scale economies were quite limited, and the marginal cost of providing marketing services was approximately horizontal over the relevant range.

A linear regression equation was used relating the retail price to the wholesale price.[1] The proposed equation was:

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[1] This section draws heavily from G.R. Allen, "Short Term Variation in Retailing Margins in East Pakistan," The Farm Economist, Vol. IX, No. 6 (1959); G.R. Allen, Agricultural Marketing Policies (Oxford: Basil Blackwell (1959), pp. 111-140; and Vernon W. Ruttan, "Agricultural Product and Factor Markets in Southeast Asia," in Anschel, Brannon and Smith, eds., Agricultural Cooperatives and Markets in Developing Countries, p. 84.

$$R_p = a + bWSP + u$$

where R_p ≡ retail price

WSP ≡ the wholesale price

a ≡ the intercept

b ≡ the slope coefficient, and

u ≡ is the error term

This equation broke the mark-up at the retail level into two: a was a constant and b was the slope coefficient showing the absolute change in retail prices which would follow from a given change in wholesale prices. If b = 1 or not significantly different from 1, the retail price would always exceed the wholesale price by the value of a. If a = 0.0 or virtually so, the retail price would always exceed the wholesale price by the value of b. If b = 1 or not significantly different from 1, it "would imply that the marketing margin is independent of price, that the supply of marketing services approximates perfect elasticity."[1] This would indicate a constant absolute margin which was not deemed consistent with possession of market power. An intermediary with market power would widen the margin between retail and wholesale when the retail prices were high. Constant margins were deemed consistent with the competitive market where scale economies were limited and the marginal cost of providing marketing services were assumed horizontal over the relevant range.

5) Testing the technical efficiency in the marketing system.

It was indicated above that physical losses in the marketing system were to be used as a measure of technical efficiency. Physical losses were estimated for each business sampled, and as far as possible, the causes of these losses were identified. The costs and benefits of preventing these losses were evaluated. If the costs outweighed the benefits, their prevention was considered infeasible, and hence the firm was considered efficient. If there were net benefits, and losses continued to be incurred, then the firm was considered technically inefficient. The percentage of efficient firms in the total sample was taken as an index of efficiency.

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[1] Vernon W. Ruttan, Ibid., p. 84.

5.5 Summary

In this chapter, the reasons for choosing the commodities used in this study and the retail areas included were explained. The methods of data collection and the adjustments made to facilitate comparisons of price data were outlined, together with the models used for testing the hypotheses formulated. The data used in this study were included in the various appendices.

CHAPTER VI

RESULTS OF THE EMPIRICAL ANALYSIS

The data were analyzed using the models described in Chapter V. Models 1 and 4 referred to the retail sector, while models 2 and 3 utilized elements of market structure and tested their impact on prices at the wholesale level. Each of the models was tested over the eight commodities selected for this study. The results indicated that, with the exception of carrots and onions, pricing of fruits and vegetables was efficient as judged by the various criteria of the perfectly competitive norm. At the retail level, correlation coefficients for prices of various commodities were high, but not uniformly so. Lack of uniform units of weight and lags in the diffusion of information were thought to contribute to the low correlations.

6.1 Testing Pricing Efficiency in Spatially Separated Markets

Nine retail areas within the City of Nairobi were selected. The areas were Burma Market, Buruburu Estate, City Centre Retail Market, Jerusalem, Kawangware, Mathare Valley, Nairobi West and Quarry Road Market. Prices were monitored for potatoes, tomatoes, green maize, oranges, onions and carrots for ten weeks in the months of June, July and August 1978. Price correlations were computed for the various commodities in different retail areas and are presented below. A correlation of 1 for a commodity between different markets over the ten week period indicated perfect unison in price movements, while a coefficient of zero was interpreted as indicative of no relationship at all in price movements. A negative coefficient indicated that prices moved in opposite directions most of the time for the period under study.

Table 6.1 is a symmetric matrix of correlation coefficients for potato prices. All elements on the main diagonal were unity, while elements on the upper triangle were left out. There were, therefore, thirty-six pairs that could be compared with each other. The highest correlation coefficient between prices in two markets was .97, while the lowest was .29.

Table 6.1 Correlation Coefficient Between Prices of Potatoes in Nine Retail Areas in Nairobi, Kenya, for Ten Weeks in June, July and August, 1978.

Market	BMA	BURU	CITY	JRSM	KWRE	MATV	WEST	QMK	WLDS
BMA	1.00								
BURU	.29	1.00							
CITY	.65	.81	1.00						
JRSM	.77	.66	.93	1.00					
KWRE	.38	.45	.56	.54	1.00				
MATV	.78	.41	.55	.62	.60	1.00			
WEST	.79	.66	.93	.97	.53	.70	1.00		
QMK	.58	.65	.66	.62	.60	.76	.65	1.00	
WLDS	.78	.41	.83	.91	.35	.48	.91	.33	1.00

Abbreviations:
BMA = Burma Market
BURU = Buruburu Estate
CITY = City Centre Retail Market
JRSM = Jerusalem
KWRE = Kawangware
MATV = Mathare Valley
WEST = Nairobi West
QMK = Quarry Road Market
WLDS = Westlands

Table 6.2 shows the frequency distribution of correlation coefficient for potato prices. Over 63 percent of the correlation coefficients were .60 and higher. A correlation coefficient of .60 was statistically significant at the 5 percent level. For potatoes, the following null hypothesis was tested:

> Ho: there was no significant relationship between prices of potatoes in the nine selected markets in Nairobi in 1978.

Seventy-eight percent of the correlation coefficients were statistically significant at the 10 percent level. The null hypothesis was therefore rejected.

Table 6.2 Frequency Distribution, Cumulative Percentage Distribution and Calculated "t" Values of Correlation Coefficients of Potato Prices in Nine Retail Areas in Nairobi, Kenya, for Ten Weeks in June, July and August 1978.

Range of "r"	Frequency	Cumulative Percentage	Calculated "t" Values
.90-.99	5	13.89	8.41***
.80-.89	2	19.45	4.55***
.70-.79	5	33.34	3.21**
.60-.69	11	63.90	2.42**
.50-.59	5	77.79	1.86*
.40-.49	4	88.90	1.43
.30-.39	3	97.23	1.05
.20-.29	1	100.01	.73
Total	36	100.01	

*** significant at 1% level
** significant at 5% level
* significant at 10% level

Table 6.3 shows correlation coefficients for prices of green maize between the nine retail areas selected. The lowest coefficient was .25 and the highest correlation coefficient was .90. Table 6.4 shows the frequency distribution and cumulative percentages of the correlation coefficients. Over 66 percent of the coefficients were significant at the 10 percent level. The null hypothesis that there

Table 6.3 Correlation Coefficients Between Prices of Green Maize in Nine Retail Areas in Nairobi, Kenya, for Ten Weeks in June, July and August, 1978.

Market	BMA	BURU	CITY	JRSM	KWRE	MATV	WEST	QMK	WLDS
BMA	1.00								
BURU	.78	1.00							
CITY	.46	.42	1.00						
JRSM	.52	.84	.38	1.00					
KWRE	.41	.63	.61	.86	1.00				
MATV	.67	.63	.82	.90	.71	1.00			
WEST	.66	.58	.66	.81	.32	.80	1.00		
QMK	.33	.77	.57	.75	.55	.73	.70	1.00	
WLDS	.25	.44	.66	.33	.46	.39	.72	.36	1.00

Table 6.4 Frequency Distribution, Cumulative Percentage Distribution and Calculated "t" Values of Correlation Coefficients of Green Maize Prices in Nine Retail Areas in Nairobi, Kenya, for Ten Weeks in June, July and August, 1978.

Range of "r"	Frequency	Cumulative Percentage	"t" Value Calculated at Median
.90-.99	1	2.78	8.41***
.80-.89	5	16.67	4.55***
.70-.79	7	36.11	3.21**
.60-.69	7	55.55	2.42**
.50-.59	4	66.66	1.86*
.40-.49	5	80.55	1.43
.30-.39	6	97.22	1.05
.20-.29	1	100.00	.73
Total	36	100.00	

*** significant at 1% level
** significant at 5% level
* significant at 10% level

was no relationship between retail prices in the nine retail areas was rejected.

Table 6.5 shows correlation coefficients for prices of tomatoes between the nine retail areas selected. The lowest correlation coefficient was .35, while the highest coefficient was .98. Table 6.6 shows the frequency distribution and cumulative percentage of the computed coefficients. Over 63 percent of the computed coefficients were significant at the 10 percent level. The null hypothesis that there was no relationship between prices in the nine retail areas was therefore rejected.

Table 6.7 shows correlation coefficients for prices of onions between the nine retail market areas selected for the study. Onions showed the highest correlation coefficients between prices among all the commodities studied. The lowest correlation coefficient was .76 and the highest was .98. All coefficients were significant at the 10 percent level and the null hypothesis that there was no relationship between onion prices in the nine markets was rejected. Table 6.8 shows the frequency distribution, cumulative percent and computed t-values and significance levels for onions.

Table 6.9 shows the computed correlation coefficients for prices of oranges in the nine retail areas selected in Nairobi for ten weeks in June, July and August 1978. The lowest correlation coefficient was .36, while the highest was .94. Table 6.10 shows the frequency distribution of the correlation coefficients. Over 83 percent of the coefficients were statistically significant at the 10 percent level or below. The null hypothesis that there was no relationship between prices in the nine markets in the period of study was therefore rejected.

Table 6.5 Correlation Coefficients Between Prices of Tomatoes in Nine Retail Areas in Nairobi, Kenya, for Ten Weeks in June, July and August, 1978.

Market	BMA	BURU	CITY	JRSM	KWRE	MATV	WEST	QMK	WLDS
BMA	1.00								
BURU	.78	1.00							
CITY	.88	.75	1.00						
JRSM	.67	.72	.81	1.00					
KWRE	.61	.44	.67	.53	1.00				
MATV	.72	.71	.97	.35	.47	1.00			
WEST	.65	.68	.98	.37	.48	.40	1.00		
QMK	.53	.52	.46	.44	.46	.58	.44	1.00	
WLDS	.81	.39	.50	.52	.38	.67	.50	.41	1.00

Table 6.6 Frequency Distribution, Cumulative Percentage Distribution and Calculated "t" Values of Correlation Coefficients of Tomato Prices in Nine Areas in Nairobi, Kenya, for Ten Weeks in June, July and August, 1978.

Range of "r"	Frequency	Cumulative Percentage	"t" Value Calculated at Median
.90-.99	2	5.56	8.41***
.80-.89	3	13.89	4.55***
.79-.79	5	27.78	3.21**
.60-.69	6	49.45	2.42**
.50-.59	7	63.89	1.86*
.40-.49	9	88.89	1.43
.30-.39	4	100.00	1.05
.20-.29	0	100.00	
Total	36	100.00	

*** significant at 1% level
** significant at 5% level
* significant at 10% level

Table 6.7 Correlation Coefficients Between Prices of Onions in Nine Retail Areas in Nairobi, Kenya, for Ten Weeks in June, July and August, 1978.

Market	BMA	BURU	CITY	JRSM	KWRE	MATV	WEST	QMK	WLDS
BMA	1.00								
BURU	.76	1.00							
CITY	.96	.98	1.00						
JRSM	.93	.98	.95	1.00					
KWRE	.95	.95	.93	.95	1.00				
MATV	.85	.92	.91	.91	.89	1.00			
WEST	.94	.95	.96	.94	.96	.90	1.00		
QMK	.92	.85	.91	.92	.88	.85	.92	1.00	
WLDS	.93	.95	.91	.92	.87	.87	.96	.96	1.00

Table 6.8 Frequency Distribution, Cumulative Percentage and Calculated "t" Values of Correlation Coefficients of Onion Prices in Nine Areas in Nairobi, Kenya, for Ten Weeks in June, July and August, 1978.

Range of "r"	Frequency	Cumulative Percentage	"t" Value Calculated at Median
.90-.99	29	80.56	8.41***
.80-.89	6	97.23	4.55***
.70-.79	1	100.01	3.21**
.60-.69	0	100.01	
Total	36	100.01	

*** significant at 1% level
 ** significant at 5% level

Table 6.9 Correlation Coefficients Between Prices of Oranges in Nine Retail Areas in Nairobi, Kenya, for Ten Weeks in June, July and August, 1978.

Market	BMA	BURU	CITY	JRSM	KWRE	MATV	WEST	QMK	WLDS
BMA	1.00								
BURU	.94	1.00							
CITY	.61	.52	1.00						
JRSM	.71	.74	.69	1.00					
KWRE	.69	.63	.68	.43	1.00				
MATV	.77	.50	.55	.53	.72	1.00			
WEST	.44	.82	.43	.62	.69	.67	1.00		
QMK	.58	.77	.71	.91	.81	.78	.74	1.00	
WLDS	.76	.57	.36	.47	.41	.50	.70	.69	1.00

Table 6.10 Frequency Distribution, Cumulative Percentage and Calculated "t" Values of Correlation Coefficients of Prices of Oranges in Nine Retail Areas in Nairobi, Kenya, for Ten Weeks in June, July and August, 1978.

Range of "r"	Frequency	Cumulative Percentage	"t" Value Calculated at Median
.90-.99	2	5.56	8.41***
.80-.89	2	11.12	4.55***
.70-.79	10	38.90	3.21**
.60-.69	9	63.90	2.42**
.50-.59	7	83.34	1.86*
.40-.49	5	97.23	1.43
.30-.39	1	100.01	1.05
Total	36	100.01	

*** significant at 1% level
** significant at 5% level
* significant at 10% level

Table 6.11 shows the computed correlation coefficients for prices of carrots in the nine retail areas selected in Nairobi. The lowest correlation coefficient between prices in any two markets for the ten weeks was .31, while the highest was .92.

Table 6.11 Correlation Coefficients Between Prices of Carrots in Nine Retail Areas in Nairobi, Kenya, for Ten Weeks in June, July and August 1978.

Market	BMA	BURU	CITY	JRSM	KWRE	MATV	WEST	QMK	WLDS
BMA	1.00								
BURU	.81	1.00							
CITY	.73	.80	1.00						
JRSM	.65	.77	.81	1.00					
KWRE	.89	.52	.66	.87	1.00				
MATV	.49	.62	.52	.90	.68	1.00			
WEST	.48	.52	.92	.46	.81	.42	1.00		
QMK	.31	.55	.55	.62	.55	.39	.80	1.00	
WLDS	.73	.75	.75	.73	.45	.59	.75	.63	1.00

Table 6.12 shows the frequency distribution, cumulative percent and computed t-values for the correlation coefficients. Over 80 percent of the coefficients were statistically significant at the 10 percent level or below. The null hypothesis that there was no relationship between prices of carrots over the period of study in the nine markets was therefore rejected.

Table 6.13 is the overall summary of price correlation coefficients for all the commodities that were statistically significant at the 10 percent level or less. Onions had the highest correlation coefficients for prices between the nine markets over the period of

Table 6.12 Frequency Distribution, Cumulative Percentage and Calculated "t" Values of Correlation Coefficients of Prices of Carrots in Nine Retail Areas in Nairobi, Kenya, for Ten Weeks in June, July and August, 1978.

Range of "r"	Frequency	Cumulative Percentage	"t" Value at Median
.90-.99	2	5.56	8.41***
.80-.89	7	25.00	4.55***
.70-.79	7	44.44	3.22**
.60-.69	6	61.11	2.42**
.50-.59	7	80.55	1.86*
.40-.49	5	94.44	1.43
.30-.39	2	100.00	1.05
Total	36	100.00	

*** significant at 1% level
** significant at 5% level
* significant at 10% level

Table 6.13 Summary of Price Correlation Coefficients for the Commodities Selected that were Significant at the 5% Level or Less.

Commodity	% of Coefficients Significant at 10% or less
Onions	100.00
Oranges	83.34
Potatoes	80.55
Carrots	77.79
G. Maize	66.66
Tomatoes	63.89

study, while tomatoes had the lowest. Overall, however, nearly two-thirds of the correlation coefficients were statistically significant at the 10 percent level for the period of study.

6.1.1 Interpretation of the Computed Correlation Coefficients

The theoretical basis of the computation of the correlation coefficients was that the higher the correlation of price movements over time between spatially separated markets, the higher the degree of interrelationship between the markets. Prices could be closely related in markets because of collusion, but this possibly was ruled out because of the large numbers of retailers in Nairobi as described in Chapter III. Since there were no formal or informal arrangements between retailers that were identified, it was assumed that the close movement in prices was as a result of intermarket competition. If price differentials were higher than transfer costs, then arbitrage by market intermediaries would bring the prices between markets in line over time. The correlation coefficients computed in the foregoing tables were not uniformly high and showed some imperfections in pricing efficiency. Such imperfections could not be attributed to market structure, but rather to situations in which business is transacted.

The results summarized in Table 6.13 should be interpreted in light of conditions in which commodities are traded. Information on prices and quantities of produce in the marketing system is not always readily available, and where it is, its acquisition is not without cost. In addition, there is a lag between the time information is acquired and the time it is acted upon. Such a lag is not picked up in the correlation model used in this study, although it could be built in if the length of the lag were known. Where market arbitrage is concerned, risks in the direction and magnitude of price changes must be evaluated and the possible rewards compared with possible costs. After these factors are considered and price differentials reach a threshold sufficient to cover costs and associated risks, then arbitrage takes place.

The perfectly competitive norm on which the model is based assumes many buyers and many sellers and a market price which is established by supply and demand conditions. The way in which this "market price" changes as demand and supply conditions change, is not well specified in theory. Is the process of change in prices instantaneous or is it gradual? Given that prices do change in response to supply and demand, whose decision is it to change prices when all firms are price takers? This question is dealt with by Kenneth Arrow,[1] where the starting point is taken as when supply and demand conditions fall out of line. Under conditions of disequilibrium, there is no reason why a single market price should be charged by each firm. If no firm can increase supply in a very short period, then when demand is greater than supply, an individual entrepreneur can raise the price, even if competitors do not raise their price, because competitors cannot satisfy any more demand than they already do. In situations where demand is greater than supply, a competitor with lower prices will be quickly sold out, but since he cannot get additional supplies quickly at the lower price, he has an incentive to raise prices. If prices are raised beyond those of his competitors, then patronage will drop off. The converse holds when supply is greater than demand. Under conditions of disequilibrium, even under competitive conditions, price discrepancies can be expected and only move toward uniformity in the market when supply and demand conditions get back into line. This process of adjustment in prices will be affected by the possibility of accumulating or decumulating inventories and the information available to entrepreneurs. If there is no possibility of accumulating inventories, then adjustment will be faster than when inventories can be accumulated. The commodities studied were all perishable and in the absence of in-store refrigeration, could not be held for more than one week. Pricing information of competitors in other localities was not available to the majority of retail outlet entrepreneurs. Given the factors that affect price adjustment just discussed, and considering that the price data used in the analysis were collected over a ten week period, it was felt that the conditions prevailing in the marketing system in Nairobi did not seriously deviate from the competitive ideal. Nonetheless, an attempt was made to explain the price discrepancies observed.

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[1] Kenneth J. Arrow, "Toward a Theory of Price Adjustment," in K.J. Arrow and Leonid Hurwicz, eds., Studies in Resource Allocation Processes (New York: Cambridge University Press, 1977).

It was pointed out in Chapter III that sales units at the wholesale and retail levels were unstandardized. At the retail level, sales were made by lot, by weight and by volume with assorted containers of different capacities. Every retailer was asked what his price would be if he were selling by kilogram, and the quoted price recorded. Then for the first few weeks, purchases were made in whatever form (lot, volume, etc.) the sales were made and the samples weighed to determine the actual weight of the produce. It was found that while the quoted prices (on a kilogram basis) were closely related in all the markets, the units of sale, because of their weight discrepancies, concealed price variations. For example, tomatoes were sold in lots of four for 2 shillings, which translated to an effective price of 4 shillings per kilogram. Those retailers who sold by the kilogram charged a price of 6 to 8 shillings over the period of study. These variations in weights of sales units concealed price differences.

Another factor thought to cause variations in prices was the lack of recognized quality standards for all the fresh fruits and vegetables handled at the retail level in Nairobi. Price was not tied to any particular quality of produce. Grading is defined here as impartial sorting by a disinterested third party. In 1978, there was no third party grading of fresh fruits and vegetables in Nairobi. Retailers graded their produce mainly on size. For example, oranges were sold individually on the basis of "large" or "small" oranges. Where no scales were used, this was assumed to be a proxy for weight rather than a distinction of quality differences. The price data collected for the study was based on subjectively determined quality features which involved freshness and lack of physical damage (e.g., bruising and rotting). Although a uniform scoring system was attempted all the time, the lack of specific grades to which price was tied could have concealed price variations.

The overall conclusion is that for most of the commodities studied in the nine markets, prices were related in over 60 percent of the cases at a level of significance of 5 percent or less. Whatever discrepancies that existed in prices could be explained by variations in the unstandardized sales units, lack of specific quality standards to which prices were tied and the fact that the study only dealt with price data over a ten week period. There was no mechanism to circulate price information, but the fact that quoted prices on a kilogram basis were closely related in most areas indicates that information was not a particularly serious bottleneck. Most price variations could be attributed to weight discrepancies in the sales units used at the retail level. Distances between the selling and supply points were reasonable and the transportation within the city was adequate.

6.2 Testing Pricing Efficiency Using Market Structure Variables

The market structure variables of number of sellers and the four-firm concentration ratios were used in models 2 and 3, as spelled out in Chapter V, to test pricing efficiency at the wholesale level. In addition, the impact of quantities flowing into the market on the prevailing price levels were tested for the eight commodities selected for the study. The impact of each of these variables was tested separately for each of the commodities. Also, a dummy variable to capture the seasonal influence of quantities of produce flowing into the market was included in all the regressions.

The results are presented in Table 6.14. The expected sign on the quantity variable was negative and it turned out to be so for all of the commodities except bananas and carrots. The quantity variable had no significant influence on the wholesale price of most of the commodities traded in Nairobi in 1977 and 1978, with the exception of green maize. The coefficient on the quantity variable for green maize had the expected negative sign which was significant at the 10 percent level.

Table 6.14 Influence of Quantity and Seasonality on Wholesale Price Levels, for Selected Commodities.

Model: WSP = a + bQTYT + c Dummy + u

Commodity	Estimated Coefficients				
	Intercept	b	c	R^2	D.W.
Bananas[1]	.844 (23.429)***	0.001 (1.384)	-.004 (-.102)	.0385	1.866
Cabbages[2]	.898 (5.54)***	-.002 (-.616)	.021 (.184)	.6955	2.4595
Carrots[2]	.714 (5.156)***	.018 (.912)	.039 (.413)	.6353	2.408
Green Maize[2]	.730 (10.485)***	-.010 (-1.708)*	.156 (2.298)**	.561	2.148
Onions[2]	3.866 (9.049)***	-.030 (-.789)	-.009 (-.028)	.5832	2.432
Oranges[2]	1.278 (14.326)***	-.018 (-1.518)	-.014 (-.114)	.1724	1.825
Potatoes[2]	1.70 (6.10)***	-.0046 (-1.13)	.2436 (1.606)	.7261	2.44
Tomatoes[2]	2.759 (3.479)***	-.051 -1.514	.824 (2.072)**	.7845	2.132

[1] Ordinary Least Squares (OLSQ) only.

[2] Ordinary Least Squares with Cochrane-Orcutt Iterative Technique.

*** significant at 1% level
** significant at 5% level
* significant at 10% level

t values in parentheses
WSP = Wholesale Price
QTYT = Total quantity
Dummy = Dummy Variable for seasonal effect: 0 if no rain previous eight weeks, 1 if rain.
D.W. = Durbin Watson Statistic.

Table 6.15 shows the effect of the number of sellers (firms) on the wholesale price level for the selected commodities. On _a priori_ reasoning, the sign coefficient for the number of sellers variable was expected to be negative. The more the number of sellers, the lower the price would be expected to be, ceteris paribus, hence the negative sign. This was a selling operation, and in the absence of collusion, the more the number of sellers, the higher the degree expected of price competition, resulting in a downward bias in the price level. If the coefficient on the number of sellers variable was positive and significantly different from zero, this would be suggestive of collusive tendencies, indicating pricing inefficiency. Carrots had a positive sign on the coefficient of the number of sellers, and this was significantly different from zero at the 10 percent level. Bananas, cabbages, onions and potatoes had a positive sign on the coefficient of the number of sellers, but none of the coefficients on these commodities were significant at the chosen levels (i.e., 1 percent, 5 percent and 10 percent). Tomatoes, oranges and green maize all had the expected signs on the coefficient of the number of sellers variable. None of these coefficients, however, were significant at the chosen levels.

Table 6.16 shows the results of the analysis using the four-firm concentration ratio (CR_4) as explanatory variable.

On _a priori_ grounds, the coefficient attached to the CR_4 variable was expected to be negative. CR_4 represents the market share of the top four firms (a proxy for market power). The higher the CR_4, the higher the market power, and if this power were exercised, the coefficients of CR_4 would be expected to be positive. As in the case with the number of sellers variable, carrots had a positive coefficient (opposite of the

Table 6.15 Influence of Number of Sellers (Firms) and Seasonality on Wholesale Price Levels for Selected Commodities.

Model: WSP = a + bNS + c Dummy + u

Commodity	Estimated Coefficients Intercept	b	c	R^2	D.W.
Bananas[1]	.859 (19.23)***	.005 (.596)	-.0007 (-.021)	.0075	1.846
Cabbages[2]	.804 (4.439)***	.006 (.541)	.058 (.48)	.6949	2.5
Carrots[2]	.640 (4.086)***	.064 (2.149)**	.036 (.398)	.6605	2.385
Green Maize[2]	.668 (8.095)***	-.001 (.061)	.171 (2.0163)**	.5341	2.205
Onions[2]	3.455 (7.075)***	.113 (1.283)	.103 (.327)	.5920	2.40
Oranges[2]	1.250 (10.402)***	-.010 (-.288)	-.042 (-.349)	.1311	1.7739
Potatoes[2]	1.475 (4.928)***	.009 (.404)	.30 (1.921)**	.7192	2.47
Tomatoes[2]	2.822 (3.698)***	-.093 (-1.376)	.965 (2.446)***	.7826	2.14

[1] OLSQ only

[2] OLSQ with Cochrane-Orcutt Iterative Technique.

*** significant at 1% level
 ** significant at 5% level

t values in parentheses

NS = number of sellers (firms)

Table 6.16 Influence of Four Firm Concentration (CR4) and Seasonality on Wholesale Price Levels for Selected Commodities

Model: WSP = a + bCR4 + c Dummy + u

Commodity	Estimated Coefficients				
	Intercept	b	c	R^2	D.W.
Bananas[1]	1.129 (2.391)***	-.003 (-.525)	-.001 (-.04)	.0059	1.8291
Cabbages[2]	.885 (3.46)***	-.0003 (-.118)	.383 (.304)	.6930	2.502
Carrots[2]	.587 (3.598)***	.002 (2.261)***	.032 (.351)	.6638	2.272
Green Maize[2]	.667 (1.995)**	-.0002 (-.0073)	1.72 (2.502)***	.5341	2.207
Onions[2]	2.64 (.759)	.011 (.322)	.005 (.014)	.5787	2.42
Oranges[2]	.356 (.332)	.008 (.809)	-.036 (-.311)	.1418	1.7961
Potatoes[2]	1.89 (5.286)***	-.005 (-1.278)	.302 (2.036)**	.7272	2.46
Tomatoes[2]	2.649 (2.349)***	-.002 (-.264)	.922 (2.297)***	.7741	2.106

[1] OLSQ only

[2] OLSQ with Cochrane-Orcutt Iterative Technique

*** significant at 1% level
** significant at 5% level

CR4 = four-firm concentration ratio in percent.

All other variables as previously defined.

expected sign) which was significantly different from zero at the 1 percent level. Onions and oranges had positive coefficients but these were not significant at the conventional levels. Bananas, cabbages, green maize, potatoes and tomatoes had the expected negative signs on the CR_4 coefficient, but none of the coefficients were significant at the chosen levels. The intercept terms were significant at the 1 percent level for all the commodities chosen except onions and oranges.

The possibility that the CR_4 variable had more than a linear effect was tested by taking the square root of the CR_4 and testing its influence using a similar regression model. Table 6.17 presents the results over the eight commodities selected for the study. The square root of CR_4, labelled CR_4S was expected to have a negative sign if no market power was exercised, just like CR_4. As it turned out, the results were similar to those obtained with the CR_4 variable. Carrots had a positive coefficient (opposite of the expected sign), which was significantly different from zero at the 1 percent level. Onions and oranges had positive coefficients, but these were not significant. Bananas, cabbages, green maize, potatoes and tomatoes had the expected negative signs on the CR_4S coefficients, but none of the coefficients were significant at the conventional levels, just like with the CR_4 variable.

The analysis up to this point tested the effect of each of the variables separately, with the other structural variables excluded from the analysis. Models 2 and 3 included more than one structural variable in the estimating equation. The results of the various combinations spelled out are presented below.

Table 6.17 Influence of the Square of the Four Firm Concentration (CR4S) and Seasonality on Wholesale Price Levels for Selected Commodities.

Model: WSP = a + bCR4S + c Dummy + u.

Commodity	Estimated Coefficients				
	Intercept	b	c	R^2	D.W.
Bananas[1]	1.356 (1.463)	-.048 (-.512)	-.002 (-.415)	.006	1.8286
Cabbages[2]	.902 (2.108)***	-.005 (-.104)	.038 (.296)	.6930	2.5
Carrots[2]	.587 (3.598)***	.017 (2.252)***	.032 (.350)	.6635	2.272
Green Maize[2]	.666 (1.059)	-.0001 (-.002)	.172 (2.504)***	.5341	2.206
Onions[2]	1.487 (.218)	.228 (.332)	.004 (.013)	.5787	2.43
Oranges[2]	-.532 (-.253)	.178 (.836)	-.036 (-.310)	.1426	1.797
Potatoes[2]	2.196 (3.744)***	-.075 (-1.208)	.299 (2.018)***	.7268	2.462
Tomatoes[2]	2.640 (2.349)***	-.018 (-.234)	.922 (2.296)***	.7740	2.108

[1] OLSQ only

[2] OLSQ with Cochrane-Orcutt Iterative Technique.

*** significant at 1% level

Model 2 was specified as follows:

$$WSP = a + bQTYT + cNS + d\,Dummy + u$$

where WSP was the wholesale price. QTYT was the total quantity, NS was the number of sellers, U was the error term and a, b, and c were the estimated coefficients. Table 6.18 shows the results of the estimating equation as tested out over the selected commodities. This model was tested for a selling operation, and as a consequence, b and c were expected to be negative. If c were positive and significantly different from zero, then it would be concluded that the number of firms had an impact on the selling price, contrary to the predictions of the perfectly competitive model.

Table 6.18 shows that the coefficient for the number of sellers for onions and carrots had a positive sign, which was opposite of what was expected. For both of these commodities, the estimated coefficients were significant at the 10 percent level, showing that the number of sellers had an influence on the price level. The expected sign on the quantity coefficient was negative and this was so for all the commodities except bananas and carrots. The coefficient for quantity was significant for green maize and oranges at the 5 percent and 10 percent levels, respectively. It is notable that if a level of significance of, say, 30 percent were chosen, all the quantity coefficients except for carrots would have been significant, showing that the selected quantity does have the expected influence on wholesale prices, except for carrots and onions as noted. From the results presented in Table 6.18, trade in the selected commodities was competitive with the possible exception of carrots and oranges, but conclusive results must await the results of the other models.

Table 6.18 Influence of Total Quantity and the Number of Sellers and Seasonality on Wholesale Price Levels for Selected Commodities.

Model: WSP = a + bQTYT + cNS + d Dummy + u

Commodity	Estimated Coefficients					
	Intercept	b	c	d	R^2	D.W.
Bananas[1]	.887	.002	-.008	.0002	.0357	1.977
	(19.05)***	(1.186)	(-.6126)	(.006)		
Cabbages[2]	.7622	-.003	.026	.0526	.7073	2.519
	(4.055)***	(-1.369)	(1.384)	(.434)		
Carrots[2]	.638	.002	.063	.037	.661	2.380
	(4.005)***	(.108)	(1.888)*	(.402)		
G. Maize[2]	.689	-.014	.020	.155	.5708	2.170
	(8.248)***	(-2.007)**	(1.024)	(2.259)***		
Onions[2]	3.52	-.065	.18	.102	.6124	2.43
	(7.76)***	(-1.56)	(1.85)*	(.331)		
Oranges[2]	1.50	-.036	.069	-.025	.2042	1.803
	(8.98)***	(-1.97)*	(1.31)	(-.210)		
Potatoes[2]	1.56	-.007	.027	.278	.7322	2.53
	(5.24)***	(-1.49)	(1.05)	(1.80)*		
Tomatoes[2]	3.01	-.043	-.074	.872	.7898	2.141
	(3.68)***	(-1.23)	(-1.067)	(2.183)***		

[1] OLSQ only

[2] OLSQ with Cochrane-Orcutt Iterative Technique

*** significant at 1% level
** significant at 5% level
* significant at 10% level

Table 6.19 presents the results of the analysis when quantity (total), the number of sellers and the market share of the top four firms were used as explanatory variables on the wholesale price levels for the selected commodities. As before, coefficients b and c were expected to be negative on *a priori* grounds. Coefficient d was expected to be positive only if market power were exercised. The results show that the b coefficients were negative, as expected for all the commodities except bananas. The b coefficients were, however, significant only for green maize, oranges and potatoes. The c coefficient had the negative expected sign for bananas, potatoes and tomatoes, but cabbages, carrots, green maize, onions and oranges had a positive sign, of which only onions was significant at the 1 percent level. The d coefficient was negative for bananas, potatoes, and tomatoes, showing that market power had no influence on prices. However, cabbages, carrots, green maize, onions and oranges had a positive d coefficient, but this was only significant for onions. According to this model, only onions showed evidence of some market imperfection, with the c and d coefficients with opposite signs to what was expected and with the c and d coefficients both significant at the 1 percent level. From the results of the two models presented so far, onions showed market imperfection with both models, and carrots showed market imperfection with the first model only.

Table 6.20 shows the results when the square root of the four-firm concentration ratio was used as explanatory variable instead of the four-firm concentration ratio, together with the other variables as defined. The model used was:

$$WSP = a + bQTYT + cNS + dCR4S + e\ Dummy + u$$

Table 6.19 Estimated Coefficients on the Influence of Total Quantity, the Number of Sellers, the Four Firm Concentration Ratio and Seasonality on Wholesale Price Levels for Selected Commodities.

Model: WSP = a + bQTYT + cNS + dCR4 + e Dummy + u

Commodity	Estimated Coefficients						
	Intercept	b	c	d	e	R^2	D.W.
Bananas[1]	1.373 (1.487)	.003 (1.506)	-.018 (-.855)	-.496 (-.554)	-.009 (-.247)	.054	1.866
Cabbages[2]	.604 (.681)	-.003 (-1.024)	.031 (.977)	.002 (.180)	.459 (.357)	.7075	2.51
Carrots[2]	.564 (3.21)***	-.003 (-.134)	.043 (1.23)	.001 (1.419)	.034 (.368)	.6752	2.26
G. Maize[2]	.558 (8.97)	-.014 (-1.992)**	.025 (.797)	.001 (.211)	.157 (2.250)***	.571	2.18
Onions[2]	-7.81 (-1.45)	-.062 (-1.545)	.393 (2.852)***	.109 (2.11)***	.159 .534	.6473	2.42
Oranges[2]	.623 (.248)	-.034 (-1.61)*	.079 (1.15)	.005 (.209)	-.029 (-.238)	.2041	1.806
Potatoes[2]	2.56 (4.02)***	-.008 (-1.85)**	-.008 (-.256)	-.009 (-1.762)*	.235 (1.529)	.7494	2.46
Tomatoes[2]	3.450 (2.92)***	-.043 (-1.24)	-.078 (-1.117)	-.004 (-.520)	.867 (2.151)***	.7911	2.12

[1] OLSQ only

[2] OLSQ with Cochrane-Orcutt Iterative Technique

*** significant at 1% level
** significant at 5% level
* significant at 10% level

Table 6.20 Estimated Coefficients on the Influence of Total Quantity, the Number of Sellers, the Square Root of the Four Firm Concentration Ratio and Seasonality on Wholesale Price Levels for Selected Commodities.

Model: WSP = a + bQTYT + cNS + dCR4S + e Dummy + u

Commodity	Estimated Coefficients						
	Intercept	b	c	d	e	R^2	D.W.
Bananas[1]	1.798	.0021	-.0173	-.092	-.0092	.054	1.8651
	(1.040)	(1.502)	(-.847)	(-.542)	(-.247)		
Cabbages[2]	.615	-.0027	.028	.014	.048	.7073	2.51
	(.41)	(-1.0)	(.920)	(.098)	.37		
Carrots[2]	.564	-.0029	.0435	.0125	.033	.6749	2.263
	(3.22)***	(-.133)	(1.225)	(1.405)	(.368)		
G. Maize[2]	.4368	-.0144	.0251	.0238	.1576	.5713	2.1796
	(.4026)	(-1.994)**	(.8219)	(.2325)	(2.2544)***		
Onions[2]	-18.12	-.062	.391	2.122	.158	.6473	2.42
	(-1.766)*	(-1.548)	(2.85)***	(2.110)***	(.532)		
Oranges[2]	.016	-.0336	.0796	.111	-.0292	.2042	1.81
	(.0032)	(-1.579)	(1.17)	(.236)	(-.244)		
Potatoes[2]	3.158	-.0083	-.0075	-.146	.23	.7476	2.467
	(3.15)***	(-1.820)*	-.233	(-1.66)*	1.509		
Tomatoes[2]	3.34	-.043	-.075	-.028	.866	.7905	2.123
	(2.78)***	(-1.235)	(-1.07)	(-.376)	(2.145)***		

[1] OLSQ only

[2] OLSQ with Cochrane-Orcutt Iterative Technique

*** significant at 1% level
** significant at 5% level
* significant at 10% level

where WSP was the wholesale price, QTYT was the total quantity, NS were the number of sellers, CR_4 was the square root of the four-firm concentration ratio and Dummy was a variable to capture the seasonal movement in prices. The estimated coefficients were a, b, c, d and e. The square root of the four-firm concentration ratio was used to test whether the four-firm concentration ratio had more than a linear effect on the wholesale price levels. The results in Table 6.20 were broadly similar to those in Table 6.19. The expected signs on the b, c and d coefficients were the same as in Table 6.19, i.e., negative for b and c and positive for d, if market power was exercised. The square root of the four-firm concentration ratio gave results broadly similar to those obtained with the four-firm concentration ratio variable.

The F-test was carried out on equations 2 and 3 to determine whether the addition of the number of sellers and the four-firm concentration ratio variables increased the explanatory power of the two models. The addition of the number of sellers variable significantly increased the explanatory power of model 2 only for carrots and onions. For all the other commodities, the null hypothesis that the addition of the number of sellers (firms) variable did not significantly increase the explanatory power was accepted. When the four-firm concentration ratio variable was added as in model 3, it only significantly increased the explanatory power of the model for onions and potatoes. The null hypothesis that the four-firm concentration did not significantly increase the explanatory power of the model was accepted for all the other commodities except for onions and potatoes. These were the only two commodities for which the CR_4 variable was significantly different from zero at the chosen levels. As pointed out above, only for onions did the coefficient on the CR_4 variable have a sign opposite to what was expected on a priori reasoning.

6.2.1 Interpretation of the Results

Each of the market structure variables was first included in a regression model as an explanatory variable for wholesale price levels for each of the commodities and then included in combinations as specified in Models 2 and 3. The inclusion of the number of sellers and the four-firm concentration ratio (CR_4) significantly added to the explanatory power of the models only for carrots and onions. For the number of sellers variable, only carrots had a coefficient with a sign opposite to that expected and this was significant at the 10 percent level. For the four-firm concentration ratio (CR_4) variable and the square of the concentration ratio variable (CR_4S), carrots again had a coefficient opposite in sign to what was expected on a priori grounds, significant at the 1 percent level. When a combination of total quantity and the number of sellers variables were included in the same model, the signs on carrots and onions on the number of sellers coefficient were positive (opposite of expected sign), and both were significant at the 10 percent level. When the three explanatory variables, i.e., QTYT, NS and CR_4, were included in the same model, only onions had significant coefficients on the NS and CR_4 variables that were opposite in sign to what was expected on a priori grounds. This was the same when the CR_4S variable was used in the same combination instead of the CR_4 variable.

There was evidence of multi-collinearity between several variables which made interpretation of some of the models difficult. For example, the NS and QTYT variables were highly correlated for most commodities, which was a logical expectation. The more the number of sellers, the more the total quantity would be expected to be, all else being equal. For oranges for example, the simple correlation between the NS and QTYT variables was .85 (the highest), while for potatoes the simple correlation was .35 (the lowest). The CR_4 and QTYT variables were in most cases negatively correlated. A simple test for multi-collinearity between two independent variables is to drop one variable out of the regression and determine whether the remaining variable becomes more statistically significant.[1] When this was done, only for carrots was multi-collinearity found to be a serious problem. Correlation coefficients between the variables for the selected commodities are shown in the appendices.

The evidence was conclusive that market structure variables, i.e., the number of sellers and the four-firm concentration ratios, affected the wholesale price levels for onions. Pricing for carrots appeared to be influenced by market structure variables, but this was attributed to the statistical problem of multi-collinearity than to market structure imperfection. In Table 3.4 of Chapter III, it was shown that carrots and onions had the highest and second highest average weekly four-firm concentration ratio at 77.57 percent and 70.16 percent, respectively. These were the only commodities for which the market share of the top four firms was 70 percent and above. The question arises why the evidence for onions with a slightly lower four-firm concentration ratio was much more conclusive than that for carrots.

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[1] Dale Orr, Applied Econometrics (Toronto: University of Toronto Press, 1977), pp. 54-60.

Does this suggest that there was a critical concentration below which the CR_4 variable had little significant influence on price levels? Previous studies found a relationship between profit rates and concentration levels and examined whether the relationship between concentration and profitability was discontinuous at some critical level. Joe Bain[1] found a weak linear relationship between concentration and profit rates. However, he found a significantly higher rate of return in those industries in which the eight-firm concentration ratio was above 70 percent than for those industries with a lower concentration ratio. Kilpatrick,[2] Norman Collins and Lee Preston,[3] and David Kamerschen,[4] on the other hand, found that the continuous relationship seemed stronger than the discontinuous relationship. To resolve this question, Meehan and Duchesneau[5] used data from 186 firms in 32 industries for the years 1954 to 1963. Their findings indicated a discontinuous relationship, with a critical level of 55 percent at the four-firm level and 70 percent at the eight-firm level, which seemed to support Bain's findings rather than those of the other authors.

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[1] Joe S. Bain, "Relation of Profit Rate to Industry Concentration: American Manufacturing 1936-1940," Quarterly Journal of Economics (August 1951), pp. 293-324.

[2] Robert Kilpatrick, "The Choice Among Alternative Measures of Industrial Concentration," The Review of Economics and Statistics (May 1967), pp. 259-260.

[3] Norman Collins and Lee E. Preston, Concentration and Price Cost Margins in Manufacturing Industries (Berkeley: Univ. of California Press, 1968.

[4] David Kamerschen, The Determination of Profit Rates, in "Oligopolistic Industries," The Journal of Business (July 1969), pp. 297-298.

[5] James W. Meehan, Jr., and Thomas D. Duchesneau, "The Critical Level of Concentration: An Empirical Analysis," Journal of Industrial Economics, Vol. 22 (1973), pp. 21-36.

The present study utilized wholesale price data as opposed to profit rates data. Data on marketing costs were not available, but the quantity handled was included as a crude proxy for the cost side. To test whether there was a cutoff point in pricing behaviour at the 55 percent four-firm concentration ratio and again at 70 percent, the data for onions and carrots were divided into two subsamples. First, for each commodity, a regression was run on Model 3 for the entire sample. All those observations for which the CR_4 was over 55 percent were separated from those observations under 55 percent and separate regressions were run on each subsample for each of the two commodities. The Chow test[1] was performed to test whether the regression coefficients from the two subsamples had structural differences. The null hypothesis was formulated as:

Ho: there were no significant structural differences in the estimated coefficients from the two different subsamples.

The F-test statistics calculated for both carrots and onions were not significantly different from zero at the 10 percent level. The same test was repeated with CR_4 at 70 percent and above and the test was not conclusive.

The question of why onions, of the eight commodities selected for study, showed evidence of market imperfection was pursued further. In 1967, the Kenya government passed legislation which restricted trading in certain items to the citizens of the country.[2] The act prescribed that non-citizens may only trade in what were described as "general business areas", but were prohibited from dealing in certain specified goods. In 1969, fruits and vegetables were included in the list of prohibited items. Wilson[1] analyzed the combined effects of the Trade Licensing Act and appointment of trading agents by the Horticultural Crops Development Authority (HCDA) on onion trading. The two measures disturbed the pattern of trade in onions in the major urban centres of Nairobi, Mombasa and Nakuru, as some of the originally appointed agents of the HCDA were non-citizens and therefore affected by the Act. The HCDA issued directives that all onions intended for retailing must be purchased exclusively by sub-agents of the HCDA, while all others (i.e., wholesalers and retailers) were prohibited from transporting onions into the scheduled urban areas. "The net effect was to create a near monopoly position for the one company as agents in Nairobi and Mombasa."[2] It appeared that the effect of legislation aimed initially at opening up trade to local citizens had the effect of increasing concentration in the short run. Although the HCDA did not control prices, access to onions for marketing was restricted, even up to the period of this study, and this may explain the pricing inefficiency already noted at the wholesale level.

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[1] For uses and procedures of the Chow test, see: M. Dutta, Econometric Methods (Cincinnati: South Western Publishing Co., 1975), Chapter 6.

[2] Republic of Kenya: Trade Licensing Act No. 33 (1967).

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[1] Frank A. Wilson, Some Economic Aspects of the Structure and Organization of Small Scale Marketing Systems - Marketing of Fruit and Vegetables in Kenya. Institute for Development Studies, University of Nairobi. Discussion Paper No. 176 (September 1973).

[2] Wilson, Ibid., p. 19.

6.3 Testing the Influence of Retailers on Prices at the Retail Level

The linear relationship between the retail price and the wholesale price was estimated, and depending on the values of the slope and intercept coefficients, the ability of the retailers to influence prices was inferred. In Nairobi in 1978, it seemed reasonable to expect the elasticity of supply of marketing services for fruits and vegetables to approximate perfect elasticity except in the very short run.[1] Fruits and vegetables were not stored for lengthy periods and where this was done, it was in unspecialized facilities in the trading premises. From the description in Chapter III, many retail establishments were small and it seemed that scale economies were quite limited, and the marginal cost of providing marketing services would be expected to be horizontal over the relevant range. The demand curve for marketing services was expected to be inelastic. The linear relationship was specified as:

$$Rp = a + bWSP$$

where RP retail price

WSP wholesale price

a and b were coefficients estimated.

If the value of b is 1 or not significantly different from 1, it would imply that the marketing margins for the selected commodities were independent of price and the elasticity of marketing services approximated perfect elasticity. Constant absolute margins are consistent with a competitive market model in a situation where scale economies are limited. Table 6.21 summarizes the results for the selected commodities. Of the eight commodities, the slope coefficient was significantly different from 1, only for bananas and potatoes. The null hypothesis was formulated as:

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[1] The reasoning behind the formulation of the model used here is outlined by G.R. Allen, Agricultural Marketing Policies (Oxford: Basil Blackwell, 1959); and by Vernon W. Ruttan, "Agricultural Product and Factor Markets in Southeast Asia," in K.R. Anschel, R.H. Brannon and E.D. Smith, eds., Agricultural Cooperatives and Markets in Developing Countries (New York: Fredrick A. Prager, Publishers, 1969).

> Ho: the b (slope) coefficient was not significantly different from 1.

Tests were performed using the student t distribution calculated as:

$$t = \frac{b - 1}{S(b)}$$

and tested at the appropriate degrees of freedom.[1] The null hypothesis was only rejected for bananas and potatoes. The intercept term was significantly different from 1 for bananas, green maize, oranges, potatoes and tomatoes.

When the results of both the intercept term and the slope coefficients were taken together, it appears that retailers had pricing discretion only for bananas and potatoes. For all the other commodities, it appeared that wholesale and retail prices changed week by week in the same proportion. The intercept was quite high for bananas, oranges, potatoes and tomatoes, suggesting that at lower wholesale prices, the fixed element was likely to have a disproportionate influence. Except for bananas and potatoes, it appeared that price changes at the wholesale level were reflected more or less accurately at the retail level. The perfectly competitive model predicts a large number of sellers, each of whom, acting singly, has no influence on price. The results in

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[1] See Barry R. Chiswick and Stephen J. Chiswick, Statistics and Econometrics: A Problem Solving Text (Baltimore: University Park Press, 1975), p. 152.

Table 6.21 indicate that retailers in Nairobi were indeed price takers except in the case of pricing of bananas and potatoes, where a semi-fixed mark-up policy was indicated.

6.4 Assessing Technical Efficiency in the Marketing System

It was indicated in Chapter V that physical losses of produce would be used as a proxy for assessing technical efficiency in the marketing system. Physical losses were chosen for two reasons. First, it was felt that conventional measures for technical efficiency such as productivity of capital and labour and technical "progressiveness" could not be accurately assessed from the data available. This would have involved valuation of capital assets employed in the marketing process. Many of the capital assets, like the various sales units described in Chapter III had no readily estimatable market value and a subjective estimation was felt to be inappropriate. Secondly, it was felt that post-harvest losses of foodstuffs in many developing countries represent a leakage in the food chain that is not always explicitly recognized.[1]

At the retail level, a sample of retailers were asked to estimate the proportion of merchandise that is lost through physical deterioration, pests and pilferage. At the wholesale level, the same information was sought from a sample of wholesalers. At both levels, the actual factors that contributed to physical losses were assessed and the cost of prevention estimated. If more were to be gained by preventing such

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[1] Harry E. Snyder estimates that during harvesting, processing and marketing of food, 10 to 20 percent is lost or discarded in developed countries and as much as 50 percent in developing countries. See Harry E. Snyder, "Food Losses - Situation and Opportunities for Improvement," in E.R. Duncan, ed., Dimensions of World Food Problems (Ames, Iowa: The Iowa State University Press, 1977).

Table 6.21 Estimated Linear Relationship Between Retail and Wholesale Prices of Selected Commodities in Nairobi, August 1977 to July 1978.

Model: Rp = a + bWSP + u

Commodity	Estimated Coefficients			
	Intercept	b	R^2	D.W.
Bananas	1.753+++ (4.87)***	.4723++ (1.178)	.078	2.02
Cabbages	$.950^{NS}$ (3.557)***	1.338^{NS} (5.29)***	.6048	2.194
Carrots	1.189^{NS} (7.611)***	1.128^{NS} (4.644)***	.5696	2.1830
Green Maize	.53+++ (5.06)***	$.883^{NS}$ (5.02)***	.5927	1.7011
Onions	$.149^{NS}$ (.193)	1.247^{NS} (6.600)***	.8328	2.495
Oranges	2.268+++ (4.303)***	1.303^{NS} (3.398)***	.3706	2.02
Potatoes	1.976+++ (8.06)***	.534+++ (3.65)***	.4496	1.962
Tomatoes	2.971+++ (6.54)***	$.752^{NS}$ (5.17)***	.5396	2.02

t ratios in parentheses

*** coefficient significant at the 1% level

+++ coefficient significantly different from 1 at the 1% level

++ coefficient significantly different from 1 at the 5% level

NS Not significantly different from 1.

losses than just suffering them, then the individual firm was deemed to be technically inefficient.

At the retail level, physical spoilage of previously unspoilt produce was estimated at only 5 percent, but retailers at times bought produce that was previously spoilt without their knowledge, because of the nature of packaging materials and containers. This point was touched upon in Chapter III. To minimize their losses, retailers only bought produce that they expected to sell within a reasonable period before the produce rotted. At the retail level, simple preservation techniques like immersing leafy vegetables in water (like watering flowers in a vase), seemed to work quite well and was widely used. But the major method to avoid produce losses was to buy in small quantities that could be sold within a reasonable period and making frequent journeys to the wholesale market as the need arose. To avoid buying previously rotted produce or a bag that had been "padded" with extreneous matter was more difficult. Efforts included buying from a wholesaler one had dealt with before, using acquired experience to spot a "padded" bag and crudely feeling the outside of a bag to determine if it has been padded.

Preservation techniques like refrigeration were not widely used. Only two of the retailers interviewed used cold storage for their fresh produce. The reasons given were the high cost of installing such facilities and lack of ancilliary services. For example, a 10 cu. ft. refrigerator in 1978 cost as much as fourteen thousand shillings, or the equivalent of two thousand U.S. dollars. For hawkers, the use of refrigerators on business premises was not feasible for lack of ancilliary services such as electricity. The hawkers operated out of very temporary premises which had neither water nor electricity. The 5 percent of losses referred to could not have justified investing in a refrigerator, especially given the small turnover of produce sales.

At the wholesale level, produce losses were estimated at 10 percent. The major causes were rotting and poor handling facilities. Wholesalers transported their produce from the rural areas in bulk, but their prediction of possible sales were less precise than those of retailers. As a result of this, produce would be left unsold and started rotting within a week. Wholesalers would certainly have benefitted from use of cold storage facilities, but none existed in the wholesale market or within its periphery. Space was not allocated to individuals within the market and in any case, no one was permitted to erect their own facilities in the wholesale market. While experience accumulated over time would allow wholesalers to predict their probable sales at different periods of the year, the physical facilities at the Wakulima Wholesale Market in Nairobi imposed problems that could only be solved by market authorities rather than individual wholesalers. One of the most serious problems was congestion. The Wakulima Market was opened in January 1967 as a wholesale market for fruits and vegetables and covers an area of about nine hectares, with about 24,100 sq. ft. of roofed space. The market is accessible both by rail and by road and has parking facilities for a maximum of seventy vehicles.

For the ten years that this market has been operational, the growth in population of the city of Nairobi has been at an estimated rate of 7.5 percent per year. Facilities that were once adequate have given rise to acute congestion. Part of the problem is due to disregard of market regulations. The space originally set aside for parking is now used as a trading area, and vehicles are forced to unload on pavements, obstructing the smooth flow of traffic, sometimes for two or three blocks around the market. Another reason is the lack of mechanical unloading facilities. Although the use of mechanical unloading might be questionable in a labour abundant economy, this might be desirable where the limits of human effort and time are effective constraints. Many wholesalers hire casual labourers to do the unloading from trucks, and unloading forty to sixty seven-ton trucks, each containing over two hundred bags, is likely to involve a lot of men, time and effort. Many traders will not unload until they have negotiated a deal and since few retailers buy a whole truck load, this tends to be time consuming, further preventing the smooth flow of traffic. Produce within the market is arranged in such a way as to make walking around difficult. Often casual labourers with heavy sacks on their backs trip on something or step on a banana peel, spilling the contents of their load on the market floor. With a steady human traffic, most of the commodities are squashed and this explains part of the produce losses at the wholesale level.

So far we have identified two major problems that contributed to physical losses in the marketing system: the nature of packaging containers that make detection of sub-standard produce difficult and the inadequacy of the physical infrastructure. These cause economic losses to individual entrepreneurs and to society as a whole, but the problems do not lend themselves to solutions by individual market participants, since any benefits accruing from corrective action cannot be fully internalized. The ingenious solutions devised by private traders (like unloading on the pavement and obstructing traffic until one's sales are concluded), clearly compound the problems rather than ameliorate them.

What is needed is a set of rules which, when obeyed, work to everyone's advantage and a mechanism to penalize violators. But there are limits that the physical infrastructure can cope with, and these limits have been reached for the Wakulima Wholesale Market, due to the needs of a rapidly growing urban population. The wholesale market needs to be enlarged and modernized with provision for some storage and conditioning rooms. The possibility of enlarging the present market appears limited, and relocation or a new market altogether is needed. This issue will be taken up further in the recommendations to be made.

CHAPTER VII

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.1 Summary

This study was concerned with the efficiency of the marketing system for fruits and vegetables in Kenya. Fresh fruits and vegetables were largely free of government control at the time of the study. Concepts of static efficiency were used in the analysis, but no attempt was made to compare the efficiency of the free marketing system with that of marketing boards. In terms of the population making a living in agriculture, numbers in wage employment and foreign exchange earnings, agriculture was shown to be a dominant sector in Kenya and is likely to remain so in the foreseeable future. In a market economy, the market generates price signals that guide the allocation of resources in investment and consumption decisions. It is important that such signals be generated and transmitted efficiently.

The per capita consumption of fruits and vegetables in Nairobi was estimated at between 41.39 kg. and 68.79 kg. per annum, but it was felt that the data used underestimated the quantity consumed. In terms of numbers of people employed, the marketing and production of fruits and vegetables employed a substantial number of people. The marketing sector involved hawkers, itinerant vendors, green grocers, provision store owners and individuals allocated stalls in Nairobi City Council operated markets. In addition to these, there were other people involved in bulking, handling and transporting fresh fruits and vegetables from various parts of the country.

In Chapter IV, the interactions between the structure, conduct and performance of the marketing system and the process of economic development were noted. The marketing system was put in the perspective of a resource using, signal generating sector with an important contribution to the process of economic development. The concepts of pricing, technical and economic efficiency were elaborated upon. Related studies in agricultural marketing in developing countries in general, and Kenya in particular, were reviewed with a note on the approaches used and conclusions reached.

In Chapter V, the methodology and models used in this study were discussed. The data collected at the wholesale level were based on the records of market fees charged by the City Council of Nairobi. At the retail level, existing sources of secondary data were supplemented by collection of primary data based on interviews with various market intermediaries.

The models used in this study were based on the predictions of the perfectly competitive model and the industrial organization model. Market structure variables were used in regression models to explain price levels, and the results interpreted on the basis of predictions of the perfectly competitive ideal. The percent of physical losses of produce at the wholesale and retail levels were used as an indicator of technical efficiency.

7.2 Conclusions

One of the conclusions reached from a description of the retail system was that trade in this sector was not concentrated in the hands of a few firms. The typical structure was small marketing firms or outlets with easy conditions of entry. Within the retail sector, however, there were barriers to entry for hawkers and green grocers. Hawkers faced entry barriers of a legal form, since licensing procedures were strict and unlicensed hawkers were subject to prosecution and confiscation of stock by city officials. Capital requirements for entry into the green grocery type of outlet were high, since these types of outlets were located in the central business district and high income (and therefore, high rent) residential areas.

Analysis of pricing efficiency in spatially separated retail outlet areas showed some imperfections. These imperfections were, however, attributed to the diversity of the units of weights and measures used, which concealed price variations and to possible lags between the times of acquisition and action on information received and to the costs and uncertainty which must be considered before market arbitrage is undertaken.

Of the eight commodities selected for study at the wholesale level, only onions showed conclusive evidence of pricing imperfection. This was attributed to government regulation aimed at opening up trade in selected items to citizens of Kenya. The regulation, passed as the Trade Licensing Act in 1967 had the side effect of concentrating trade in the hands of a few firms in the trade of a commodity where concentration levels were of no prior concern. The overall conclusion from the analysis of pricing efficiency was that this should not be an area of concern and no immediate intervention by the government is called for. It was pointed out that other issues concerned with pricing policy such as stability of prices and incomes, equity, stimulation of growth and collection of government revenue were not dealt with. Only pricing efficiency in a neutral form and as a static performance concept was evaluated.

Technical efficiency was evaluated by using physical losses of produce in the marketing system as an indicator of technical efficiency. The physical losses in the marketing system were estimated at an average of 15 percent, with 10 percent lost at wholesale and 5 percent at retail level. These losses were attributed to the nature of packaging containers that made detection of substandard produce difficult and encouraged spoilage, and to the inadequacy of the physical infrastructure at the wholesale market in Nairobi. Produce was transported from growing areas in tightly bundled-up jute sacks that were heavy to lift and trapped moisture. On reaching the wholesale market, the heavy bags were frequently dumped from the back of the transportation vehicle onto the ground. Produce became bruised or spilt on the market floor. The bags were stored on the market floor, and the bruising, together with the moisture trapped in the sack, encouraged rotting. Retailers buying produce in such sacks had no way of establishing the quality of the contents in advance and only discovered the extent of damage when they broke bulk for sales at the retail level. Any losses discovered were possibly made up for by a mark-up on the price of the balance of unspoilt produce.

7.3 Recommendations

In the market structure models used in this study, single equation linear relationships were estimated, with the wholesale price of various commodities as the dependent variable. In practice, a market price is the result of simultaneous interactions between supply and demand factors. In the relationship specified below for example, both quantity demanded and supplied are expressed as a function of price.

$$Q_d = a + bP_t + u_t$$

$$Q_s = c + dP_t + v_t$$

As specified, this is not a simultaneous model because quantity demanded and quantity supplied are distinct concepts. In practice, a single quantity which clears the market is observed. The equations specified above are observationally similar, with quantity as the dependent variable, an intercept term, a slope coefficient on the price variable and a disturbance term. An investigator cannot attribute changes in quantity to either demand or supply without additional information. To explain changes in quantity, a knowledge of other factors that influence demand and supply are necessary. The factors that influence consumer demand are the prices of related goods, the incomes and tastes of consumers, the number of consumers, the range of goods and services available to the consumer and consumer expectations. The supply of a particular commodity is affected by the price of that commodity, prices of other commodities or goods which can be produced from the same set of resources, the cost of production, the range of production techniques available, and for agricultural commodities, the weather and biological factors that influence production.

It would have been preferable to use a simultaneous system for demand and supply, with all the above factors taken into consideration. This was not done due to data constraints. However, a dummy variable was used to explain seasonal movements in prices and quantities. To formulate more complete models, data would have been needed on incomes and variations of incomes among Nairobi consumers, changes in population, the wholesale prices of related commodities, rainfall in production areas, transportation costs, quantities and prices for different commodities on a monthly basis over several years. If prices and quantities are available over several years, then conventional techniques for seasonally adjusting prices and quantities can be used instead of using dummy variables. After the appropriate data becomes available, then the demand function can be specified as follows:

$$Q_d = f(WSP, I, WP_{rg}, \Delta NC)$$

where Q_d = quantity demanded
WSP = the wholesale price of the commodity
I = the per capita income of consumers
WP_{rg} = the wholesale price of related commodities
ΔNC = change in the number of consumers over a particular period.

The supply function can, in turn, be specified as follows:

$$Q_s = f(WSP, WSP\text{-}1, R_{ga}, TC, \frac{WSP}{P_{rc}})$$

where Q_s = quantity supplied
WSP = the wholesale price of the particular commodity
$WSP\text{-}1$ = the wholesale price of the commodity in the past period
R_{ga} = rainfall in area where commodity is grown for the current growing season
TC = transportation cost from growing area to market
$\frac{WSP}{P_{rc}}$ = wholesale price relative to prices of relative commodities

The wholesale price in the past period is included on the belief that farmers use current prices to plan next period's production.

Depending on the data available, the demand and supply relationships could be specified in more detail, for example, by inclusion of distributed lag relationships and other intervening variables like government policy. The concern for this study however, was to explain the influence of market structure variables on prices. Prices, as indicated earlier are a result of interactions of supply and demand factors. The demand and supply equations could then be solved simultaneously in terms of wholesale prices. The estimated wholesale prices could then be used in the structural equations specified:

$$W\hat{SP} = f(CR_4P, NS)$$

where $W\hat{SP}$ = the wholesale prices estimated after demand and supply factors are taken into consideration

CR_4P = the four-firm concentration ratios as previously defined.

NS = the number of firms in the market

The interpretation of the signs of the coefficients would remain the same as explained in the text. This would enable more exact interpretation of the coefficients and their signs, since all other factors would have been accounted for.

Based on the analysis and on personal observations made during the course of this study and before, recommendations are made on the possible improvement of packaging units, the reorganization of the wholesale market, expansion on the availability of market information, and on the role of certain categories of market participants.

The packaging containers used in the marketing of fruits and vegetables contributed to physical losses of produce. This aspect will be discussed here in the context of grading and standardization. Grading will be defined in a very narrow context: the screening of damaged produce from good produce. The wider context of separating products into a wider range to suit individual consumer tastes will not be discussed. It was found that consumers were mainly interested only in the removal of obviously damaged produce. Standardization refers to the packaging containers used in the marketing system.

It is recommended that some form of produce inspection be instituted at the wholesale level, at least to screen out poor quality produce. This would have two important effects. Traders would be forced to put a premium on well sorted produce at the farm level and cut down on the amount of "padding" with excess leafage that is currently undertaken. Secondly, the sweeping and clean-up costs at the wholesale level would go down correspondingly. It was pointed out that an estimated thirty tons of garbage were removed from the market every week. If traders knew that excess leafage would not be allowed into the market, they would make attempts to screen it out.

The question of grading is closely related to standardization of packaging containers. Jute and sisal bags were predominantly used to transport produce from the farm to the wholesale market and retail levels. Sisal bags are manufactured in Kenya, which explains their wide availability and use. Between the farm and the local market, produce was mainly transported by bicycles, passenger vehicles or on the human back. All these modes of transportation encouraged use of jute or sisal sacks which could be filled up to a level suitable for the individual transporter. Traders in the rural areas usually combined different size loads to fill up a truck. If traders were required to transfer produce from sacks into crates, an opportunity would be created for visual inspection and removal of damaged produce and "padding" material. Given the very wide use of sacks as containers, it is doubtful whether legislation to use specific kinds of containers would be effective. It is therefore recommended that simple produce inspection be instituted. All market participants would then find what kind of containers facilitate inspection and reduced physical deterioration and would adopt such containers where economically feasible. It should be pointed out here that what is being advocated is not a specific type of packaging container, but only any type that would reduce produce loss and quality deterioration.

At the wholesale market in Nairobi, it is recommended that improvements be made in the physical infrastructure. Sanitary facilities should be improved and expanded. At the time of the study, there was only one washroom for the use of all market participants, who on an ordinary day, run into several hundred. Removal of garbage from the wholesale market was found deficient. Garbage was usually piled into one corner of the market and this rotted fast in the tropical conditions. Some of these problems were associated with the growth in the City of Nairobi and possibly were not foreseen when the market was planned, but they are now effective constraints. The present market should be enlarged, and if this is not possible, it should be relocated altogether. The present market could also be retained, with a new one constructed in a different part of the city. If a new market were constructed, it is recommended that facilities for refrigeration be constructed. Such facilities could be rented out to wholesalers or at least be available to traders unable to dispose of all their produce on a given day. This would cut down on the losses suffered at the wholesale level and would be economically justified in view of the large volumes of produce handled at this level.

At the wholesale level, it is recommended that present rules and regulations be more rigidly enforced. The problem of parking and unloading on the pavement was referred to earlier. This practice tied up traffic inside the market and surrounding areas. The flow of traffic within the market was usually obstructed by violators, and these were apparently not penalized. The market officials should be empowered to ticket offenders, and if possible, restrict their use of the market for a period of time if violations persisted. At present, traffic violations are outside the jurisdiction of city officials.

The system of information as it is presently maintained is exclusively designed for collection of revenue from market fees. Each market participant is issued a receipt on payment of the market fee, and duplicate receipts are retained for internal auditing and accounting purposes. Although the receipt books contain informtion on quantities, type of transportation and vehicle licence numbers, extraction of such information is tedious. On any given day there may be more than five hundred market entrants. To estimate any meaningful yearly data, daily entries must be extracted by the researcher. It is recommended that weekly summaries of quantities of different commodities traded in the wholesale market be maintained by market officials. Price data is maintained on a weekly basis by the Central Bureau of Statistics, and this could be usefully matched with data on quantities.

The Horticultural Development Authority broadcast information on prices at the wholesale level. This information is broadcast once a week on the radio and published in the newspapers. This information is aimed at the wholesalers, retailers and the general public. The extent to which this information reaches the target audiences was not established, but it is notable that information on prices in the growing areas was not included. It is recommended that information on prices and produce availability in the growing areas be included in the radio broadcasts and released to newspapers.

The recommendations made so far have dealt with technical and logistic aspects that can be undertaken to improve the working of the marketing system. This section would be incomplete if no mention was made of the market participants, particularly hawkers. For years now the City Council of Nairobi has pursued a policy of actively discouraging hawkers. Such policies have included prosecution, licensing procedures, impounding of merchandise and burning of shanties erected by hawkers. This policy has been justified on the grounds that hawkers pose a health hazard, violate property rights by erecting shanties on side streets and empty lots and that their shanties detract from the esthetic features of the city. These are valid concerns, but the issues also involve value judgements that cannot be objectively dealt with. The analysis in this study showed that the retail level (where hawkers conduct their businesses) worked in an economically efficient way. Hawkers and other retailers render a service demanded by the people and patronage of their outlets is proof that their service is desirable. By locating their outlets in residential areas and their willingness to sell produce in small quantities, hawkers cater to the needs of low income consumers with no means of personal transportation and who cannot afford in-home refrigeration to preserve large purchases of food. Hawkers, in turn, derive a livelihood from their occupation. Unemployment is a serious problem in Kenya, and there are few alternative job opportunities for hawkers to move into. Given the fact that hawkers play an economic role in the distribution of food in the City of Nairobi and that few alternative job opportunities can be created for relocation, hawkers should be accepted as a fact of urban life. Policies should be designed to deal with the undesirable features associated with hawkers and their businesses.

Improvement of sanitary standards could be achieved by provision of water and garbage removal facilities. Customers appreciate clean food, and any hawker wishing to please clients would improve sanitation if it were feasible to do so. Where hawkers are concentrated in one area, a central water outlet with toilet facilities could be provided. Costs could be covered by charging each hawker a flat fee or on a frequency-of-use basis. Where hawkers are located on side streets in residential areas, a public facility in an area nearby would fulfill hygienic needs.

City administrators should have the right of determining priorities to which urban land should be allocated. Hawkers should not have free access to urban land, but the land requirements for them should be incorporated in city plans wherever possible. Maintenance of law and order in such areas could be accomplished by use of rules and regulations and by licensing procedures.

The premises used by hawkers are usually unsightly and sometimes contrast sharply with permanent well maintained buildings in residential areas. Hawkers should be required to construct low cost, movable structures wherever possible. Plywood, if painted in colours in harmony with surrounding buildings, could be used. Simple fire safety and other standards could be incorporated as requirements which hawkers would have to fulfill.

The above recommendations are made with the knowledge that hawkers are a fact of urban life and will continue to circumvent policies and measures designed to discourage them. A policy of accomodation with incentives built in would help control some of the more undesirable features associated with hawkers.

7.4 Recommendations for Future Research

This study dealt with the last two stages of the marketing channel, that is, the wholesale and retail levels in the city of Nairobi. To complete the study, it is proposed that future research be carried back to the rural local markets and the farm level.

In the spatial equilibrium model used, it is proposed that the study be broadened to include important local markets, other large urban centres besides Nairobi and smaller towns in the various districts in Kenya. Such an undertaking should be possible in the near future. In 1977 the Ministry of Finance and Planning started reporting price series for commodities in various parts of the country. This information was not used in the current research since there were gaps in the available price series for many of the commodities selected for this study. The quality and availability of these price series should improve and future research should not be hampered by the necessity of collecting primary price data. Moreover, the series will make it possible to study the behaviour of prices to be studied over a longer period of time than was done for this study.

To extend the spatial equilibrium model in the manner suggested above, it will be necessary to obtain data on transportation costs and on quantities traded between various points. Such data is not currently available, but it could be generated by surveys which could be updated periodically.

The market structure model used in this study showed that the marketing system was to a large extent competitive at the wholesale and retail levels in Nairobi. It is possible that the same situation may not prevail at the farm and local market levels. The nature of the relationships between farmers and wholesalers should be explored, especially in areas of provision of credit, money lending and terms of sale, which could have important implications on competition in the marketing system.

At various points in the marketing system, the feasibility and need for investment in market facilities, communications, public scales, short term and long term facilities should be researched. These aspects should be evaluated in the light of existing and potential production and marketing possibilities.

It was indicated earlier that marketing is viewed in the broader context of economic development and is affected and, in turn, affects other areas of economic activity. In this respect, market participants like hawkers and other vendors are viewed as rational individuals responding to economic pressures, opportunities and incentives. It was indicated in the study that hawkers had the shortest stay in the same business among all the market intermediaries surveyed. It would be of interest to planners to know what induced people to enter the marketing system in the first place, what kind of occupations they had before and what educational and other skills they had initially. Further, it would be of interest to know what type of occupations hawkers and other market participants move into and what motivates them to move into other occupations (for example, higher immediate or future incomes or job security). Data for research into this area could be generated by surveys in the short run. Over an intermediate term such data could be obtained from national censuses of population which in Kenya are presently carried out every ten years.

This study dealt only with specific pricing and technical aspects of marketing efficiency. Other areas of marketing policy including broader price and income situations and equity need further research. The question of price uncertainty and fluctuations on production and marketing needs to be empirically determined. This would form the basis for specific intervention such as price and income stabilization.

This study has emphasized the role of marketing in the broader context of economic development. Economic development involves change of a society or a group within society from one position or economic position to a more desirable economic status. The transition to a different economic status is presumably accompanied by an increase in goods and services consumed or possessed by society or by improvement in the quality of such goods and services. It is in the marketplace that society expresses its wishes by choice of goods and services that satisfy felt needs. The choices so expressed in the marketplace indicate the ends to which resources should be directed. The marketplace therefore simultaneously satisfies the needs of individuals within society and offers signals toward desired directions of change. The marketing system also brings together consumers and producers and encourages specialization of functions. Specialization raises output as economic agents become more proficient in their particular occupation. If there were no exchange, and hence marketing, every individual would be forced to be self-sufficient in all goods and services, and the benefits of specialization would be lost to society. Marketing leads to the acquisition of higher skills in an effort to satisfy diverse needs.

It was noted by earlier researchers that African businessmen frequently lack commercial skills, presumably because of the tendency of self-sufficiency in many African societies. As specialization of production expands and the need for marketing increases, the necessary skills and entrepreneurial ability are called for and rewarded in the marketplace. Marketing is therefore important as a source of skills and capital which can be directed to further development effort. The marketing system also provides the organizational framework necessary to coordinate production and consumption and to ration the supply of commodities to consumers in response to their expressed needs. These considerations highlight the importance of an efficiently working marketing system in the course of economic development. Resources should be devoted to the marketing system, just like resources are devoted to productive activities in the economy. A strong marketing system spreads benefits to other sectors of the economy through the multiplier effects of consumption and investment expenditures, acquired skills and capital and innovative activity. Therefore marketing improvement should be given as much attention and resources as production activities.

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APPENDIX 1

PRICE AND MARKET STRUCTURE DATA FOR BANANAS

WSP	RP	QTYT	QTY4	NS	CR4P
.70	1.25	64	64	20	87.50
.75	2.25	990	966	7	97.58
.97	1.75	1117	930	12	83.26
.84	2.50	1159	870	37	52.57
.84	2.50	1444	967	20	66.97
.97	2.50	2009	1160	21	57.74
.97	2.25	940	603	15	64.15
.97	2.50	2150	1124	25	62.46
.70	2.50	2207	2051	8	92.93
.97	2.50	3006	2300	14	76.51
.70	1.75	507	458	8	90.34
.89	2.50	1178	656	28	62.75
.89	2.50	1542	900	23	58.37
1.06	2.25	3243	1650	27	50.88
.92	1.75	2394	1050	34	43.86
.50	1.75	301	240	11	79.73
.70	2.00	923	486	15	52.65
.97	2.50	1924	1100	20	56.64
.92	1.75	766	629	12	82.11
.70	1.75	1380	1257	14	91.09

APPENDIX 1

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR BANANAS

WSP	RP	QTYT	QTY4	NS	CR4P
.78	2.50	2747	1725	17	62.80
.97	2.50	891	720	15	80.81
.95	2.25	1901	1350	15	71.02
.78	2.25	1203	1185	6	98.50
.97	2.50	2719	2475	10	91.03
.97	2.50	505	460	10	91.03
.95	2.50	3256	2100	26	64.50
.75	1.75	5095	2424	29	47.58
.97	2.25	5876	2109	32	35.89
1.06	2.00	6532	2500	41	38.27
.97	2.50	4457	1900	45	42.63
.70	2.50	4753	2400	52	50.49
.70	2.5	6064	2650	48	43.70
.97	2.5	7565	2950	46	39.00
.97	2.5	4677	2300	47	49.18
.97	1.7	2645	1758	37	66.47
.97	1.7	4578	2150	38	46.96
.95	1.2	6624	2550	53	38.50

APPENDIX 1

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR BANANAS

WSP	RP	QTYT	QTY4	NS	CR4P
1.06	1.7	5182	2712	50	52.34
.97	2.5	5488	2800	37	51.02
.70	2.5	7100	3065	68	43.17
.92	2.5	4801	1950	69	40.62
.75	2.7	6588	2450	46	37.19
.75	2.5	1802	1752	6	97.23
.97	2.5	3066	2409	20	78.57
.95	2.5	1257	1040	12	82.74
.97	2.5	5291	2800	31	52.92
.75	2.5	7997	3100	27	38.76
.97	2.5	5935	2950	42	49.71
.78	1.7	3294	2209	32	67.06
1.06	2.5	5083	2904	26	57.13

APPENDIX 2

PRICE AND MARKET STRUCTURE DATA FOR CABBAGES

WSP	RP	QTY1	QTY4	NS	CR4P
1.61	2.50	1514	367	27	24.24
1.39	2.50	690	476	10	68.99
1.50	1.75	818	435	11	53.18
1.39	2.50	308	200	10	64.94
.95	1.75	716	640	7	89.39
1.00	2.25	708	603	7	85.17
1.03	2.25	359	335	8	93.31
.95	1.75	518	473	6	91.31
1.11	2.25	886	390	24	44.02
1.17	2.25	785	400	21	50.96
1.06	2.25	714	210	29	29.41
1.11	2.25	1126	430	40	33.41
.94	1.75	573	318	17	55.50
.84	1.75	1160	525	19	45.26
.72	1.50	585	305	18	52.14
.78	1.75	620	288	21	46.45
.50	1.25	1670	545	29	32.63
.53	1.75	1384	420	33	30.35
.61	2.25	1256	300	29	23.89
.53	1.75	595	245	19	41.18

APPENDIX 2

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR CABBAGES

WSP	RP	QTYT	QTY4	NS	CR4P
.50	1.75	689	378	16	54.86
.53	1.75	624	265	13	42.47
.42	1.25	426	230	11	53.99
.47	1.75	1486	400	27	26.92
.50	1.25	2762	660	47	23.90
.47	1.25	2772	540	53	19.48
.61	1.75	3037	470	52	15.48
.56	1.75	2990	470	46	15.72
.61	2.50	4547	766	60	16.85
.72	2.25	4554	600	61	13.18
.78	2.50	2983	520	48	17.43
.95	2.75	3800	522	50	13.74
.84	2.25	1524	320	27	21.00
.95	2.50	3523	320	70	9.65
1.06	2.75	5457	400	97	7.33
1.06	3.50	4751	340	97	7.16
.95	3.00	5159	380	100	7.37
.84	2.25	5763	420	109	7.29

APPENDIX 2

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR CABBAGES

WSP	RP	QTYT	QTY4	NS	CR4P
.84	2.25	1626	686	14	54.29
.84	2.50	1054	694	11	65.84
.95	2.75	2418	741	25	30.65
1.06	2.75	5687	733	57	12.89
1.67	3.50	3120	762	31	24.42
1.22	2.50	4410	610	51	13.83
1.84	3.00	2481	576	33	23.22
1.45	2.75	3737	682	37	23.60
1.34	3.50	3974	719	42	18.09
1.06	2.50	3555	634	41	17.83

APPENDIX 3

PRICE AND MARKET STRUCTURE DATA FOR CARROTS

WSP	RP	QTYT	QTY4	NS	CR4P
1.00	1.25	4	4	1	100.00
1.12	1.50	100	10	1	100.00
1.14	1.50	0	0	0	0.00
1.57	2.25	80	80	3	100.00
.82	1.75	46	38	6	82.61
1.00	2.25	102	50	8	49.02
.78	2.50	34	34	3	100.00
.59	1.75	118	106	6	89.83
.68	1.25	157	137	7	87.26
.78	1.75	164	125	8	76.22
.84	2.25	146	123	6	84.25
.75	1.75	63	63	3	100.00
.68	1.75	272	243	8	89.34
.68	1.75	184	129	9	70.11
.68	1.75	369	200	14	54.12
.78	2.25	206	130	11	63.11
.68	1.75	40	40	2	100.00
.50	1.75	272	196	13	72.06
.50	1.25	235	135	11	57.45
.59	1.75	273	110	20	40.29

APPENDIX 3

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR CARROTS

WSP	RP	QTYT	QTY4	NS	CR4P
.43	1.75	256	165	13	63.28
.39	1.50	400	210	18	52.50
.43	1.75	385	170	19	44.16
.41	1.50	61	61	3	100.00
.50	1.75	78	72	5	92.31
.43	1.75	56	56	3	100.00
.48	2.25	20	20	1	100.00
.50	1.75	224	160	8	71.43
.50	1.75	561	216	19	38.50
.41	1.75	214	170	8	79.44
.41	1.75	95	95	3	100.00
.43	1.50	160	135	7	84.38
.59	2.25	80	67	18	83.75
.78	2.75	204	155	12	75.98
.68	2.75	158	158	4	100.00
.68	2.25	85	85	4	100.00
.59	1.75	130	130	2	100.00
.50	1.75	72	72	3	100.00

APPENDIX 3

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR CARROTS

WSP	RP	QTYT	QTY4	NS	CR4P
.59	2.25	102	102	4	100.00
.64	2.75	31	31	2	100.00
.84	2.25	192	180	6	93.75
1.18	3.50	120	110	6	91.67
1.00	2.50	264	232	7	87.88
.78	2.50	0	0	0	.00
1.14	2.75	0	0	0	.00
1.05	2.50	30	30	1	100.00
1.14	3.00	205	150	7	73.70
1.00	2.75	0	0	0	.00
1.41	2.75	135	109	10	80.74
1.23	2.25	76	76	3	100.00
1.14	2.75	173	153	6	88.44
1.23	2.50	77	77	4	100.00
5.98	2.75	196	184	5	83.88

APPENDIX 4

PRICE AND MARKET STRUCTURE DATA FOR GMAIZE

WSP	RP	QTYT	QTY4	NS	CR4P
.36	.80	5	5	1	100.00
.34	.80	344	322	9	93.60
.34	.80	483	255	15	52.80
.30	.80	1000	310	35	31.00
.30	.80	893	320	26	35.83
.39	1.20	682	290	29	42.52
.50	1.20	537	255	24	47.49
.45	.80	808	297	18	36.76
.50	1.20	334	311	7	93.11
.50	1.20	208	190	7	91.35
.50	.90	551	379	12	68.78
.77	1.20	572	261	18	45.63
.77	1.20	486	230	19	47.33
.86	1.76	606	195	23	32.18
.77	1.20	767	230	26	29.99
1.00	1.26	446	220	13	49.33
.91	1.26	590	146	26	24.75
.82	1.20	921	280	27	30.40
.91	1.50	237	155	10	65.40
.77	1.20	785	210	30	26.75

APPENDIX 4

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR GMAIZE

WSP	RP	QTYT	QTY4	NS	CR4P
.68	1.20	413	155	19	37.53
.64	1.20	656	179	28	27.29
.64	1.20	169	119	7	70.41
.77	1.26	313	150	12	47.92
.86	1.26	30	29	5	96.67
.73	1.26	56	56	4	100.00
.77	1.76	230	140	17	60.87
.77	1.26	640	279	25	21.84
.68	.80	529	250	18	47.26
.77	1.26	398	152	24	38.19
.68	1.10	561	182	24	33.51
.59	.80	787	230	32	29.22
.50	.70	435	204	26	46.90
.86	1.20	411	209	25	50.85
.86	1.20	231	119	19	51.52
.86	1.26	419	220	20	52.51
.86	1.26	229	159	12	69.43
.82	1.16	261	186	16	71.26

APPENDIX 4

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR GMAIZE

WSP	RP	QTYT	QTY4	NS	CR4P
.34	1.16	276	210	13	76.09
.86	1.26	420	290	12	69.05
1.05	1.76	667	280	21	41.98
1.05	1.76	308	260	15	84.42
.68	1.26	600	315	27	26.27
.91	1.76	91	91	3	100.00
.77	1.26	168	149	5	88.69
.91	1.26	244	230	7	94.26
.95	1.76	721	290	17	40.22
.93	1.76	470	270	12	57.45
.77	1.76	1307	300	35	22.95
1.05	1.76	1046	299	30	28.59
.91	1.20	866	334	25	38.57

APPENDIX 5

PRICE AND MARKET STRUCTURE DATA FOR ONIONS

WSP	RP	QTYT	QTY4	NS	CR4P
3.75	5.50	95	95	2	100.00
4.46	5.50	206	139	10	67.48
3.75	4.50	20	20	2	100.00
4.11	4.50	255	173	10	67.84
3.93	3.50	110	92	7	83.64
4.82	5.50	240	170	10	70.83
4.11	5.50	400	255	15	63.75
3.93	4.50	384	196	15	51.04
4.29	5.50	238	199	7	83.61
3.93	5.50	238	146	11	61.34
4.82	5.50	231	146	10	63.20
3.39	5.50	626	366	15	58.47
4.64	5.50	194	149	9	76.80
3.93	5.50	197	182	7	92.39
4.46	5.50	461	304	14	65.94
3.21	4.50	668	345	18	51.65
2.68	3.50	437	294	12	67.28
3.04	4.50	560	240	21	42.86
2.68	3.50	376	282	12	75.00
2.68	3.50	421	223	17	52.97

APPENDIX 5

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR ONIONS

WSP	RP	QTYT	QTY4	NS	CR4P
3.04	3.50	130	120	7	92.31
3.21	3.50	784	665	14	84.82
3.21	3.50	400	328	10	82.00
2.68	3.50	47	47	2	100.00
3.04	3.50	363	320	6	88.15
2.68	2.50	148	140	6	94.59
3.04	2.50	689	610	10	88.53
3.04	3.50	1100	255	39	23.18
2.86	2.50	751	295	26	39.28
3.04	3.50	361	252	11	69.81
3.21	2.50	350	245	9	70.00
2.50	3.50	409	318	9	77.75
2.68	3.50	436	296	11	67.89
2.86	4.50	154	138	8	89.61
3.04	4.50	249	175	13	70.28
2.68	3.50	447	248	18	55.48
3.04	3.50	363	235	13	64.74
3.04	3.50	274	130	16	47.45

APPENDIX 5

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR ONIONS

WSP	RP	QTYT	QTY4	NS	CR4P
2.96	3.50	536	221	24	41.23
3.04	3.50	490	304	15	62.04
3.04	4.00	508	302	24	59.45
3.39	5.50	305	258	9	84.59
3.93	7.50	520	260	26	50.00
3.93	7.50	74	74	3	100.00
5.36	8.50	185	129	11	69.73
5.36	9.50	166	115	8	69.28
6.07	9.50	82	54	9	65.85
5.36	9.50	93	75	9	80.65
3.93	5.50	336	228	12	67.86
4.64	7.50	297	202	16	68.01
5.36	8.50	232	134	17	57.76

APPENDIX 6

PRICE AND MARKET STRUCTURE DATA FOR ORANGES

WSP	RP	QTYT	QTY4	NS	CRP4
.97	4.50	51	47	5	92.16
.94	5.50	88	80	7	90.91
.94	4.50	298	280	8	93.96
1.19	4.50	402	225	24	55.97
1.16	4.50	145	116	11	80.00
1.56	3.50	147	75	14	51.02
1.31	3.50	308	200	21	64.94
.94	3.50	51	45	6	88.24
1.06	4.50	75	75	4	100.00
1.00	4.50	274	255	7	93.07
1.06	3.50	331	246	14	74.32
1.06	3.50	82	79	5	96.34
1.31	4.50	50	35	8	70.00
1.19	3.50	114	97	6	85.09
1.19	4.50	74	72	5	97.30
1.13	3.50	140	116	7	82.86
1.16	3.50	45	35	7	77.78
1.00	2.75	105	96	8	91.43
1.19	3.50	149	68	20	45.64
1.31	3.50	206	145	14	70.39

APPENDIX 6

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR ORANGES

WSP	RP	QTYT	QTY4	NS	CR4P
1.06	2.75	245	129	23	52.65
1.19	3.50	68	42	9	61.76
1.19	4.50	14	14	3	100.00
.94	3.50	192	154	13	80.21
.81	3.50	180	122	15	67.78
.88	3.50	85	72	10	84.71
1.38	3.50	253	129	21	50.99
1.16	2.75	102	87	11	85.29
1.22	3.50	177	149	13	84.18
1.19	2.50	77	44	12	57.14
1.94	4.50	220	140	12	63.64
1.81	4.50	332	163	22	49.10
1.06	4.50	308	202	25	65.58
1.06	4.50	302	174	22	57.62
1.63	3.50	130	96	12	73.85
1.38	3.50	399	180	28	45.11
1.19	4.50	854	270	32	31.62
1.09	3.50	815	270	41	33.13

APPENDIX 6

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR ORANGES

WSP	RP	QTYT	QTY4	NS	CR4P
.81	2.50	887	375	41	42.28
1.06	4.50	1087	362	45	33.30
.81	2.50	767	340	31	44.33
.94	4.50	2005	400	78	19.95
1.75	5.50	60	60	3	100.00
1.69	5.50	389	250	28	64.27
.94	5.50	366	210	16	57.38
1.06	4.50	1035	328	32	31.69
.81	3.50	949	262	26	29.72
1.06	4.50	1302	300	45	23.04
2.06	6.00	654	258	25	39.45
1.69	6.50	573	211	30	36.82

APPENDIX 7

PRICE AND MARKET STRUCTURE DATA FOR POTATOES

WSP	RP	QTYT	QTY4	NS	CR4P
1.25	3.50	21	21	4	100.00
1.15	2.75	338	226	10	66.86
1.25	3.50	2719	510	52	18.76
1.25	2.50	3759	650	75	17.29
1.25	2.50	2759	818	30	29.65
1.55	2.25	2840	814	28	28.66
1.55	2.50	2496	780	27	1.25
1.15	2.50	3143	966	32	30.73
1.35	2.75	1474	727	17	49.32
1.35	2.75	3046	1174	26	38.54
1.35	2.75	3041	1185	25	38.97
1.95	2.50	3167	729	68	23.02
2.10	2.50	1723	246	52	14.28
1.85	2.50	2781	315	81	11.33
1.95	2.50	2864	452	50	15.78
1.45	2.50	1571	399	30	25.40
1.35	2.50	4549	771	62	16.95
1.38	2.50	2945	520	51	17.66
1.95	2.75	1490	437	24	29.33
.95	2.50	4027	750	60	18.62

APPENDIX 7

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR POTATOES

WSP	RP	QTYT	QTY4	NS	CR4P
1.25	2.75	4116	625	57	15.18
1.15	2.50	3545	522	56	14.72
1.25	3.00	1987	440	40	22.14
.75	2.50	2038	861	24	42.25
.95	2.50	922	350	21	37.96
.85	2.50	1019	588	22	57.70
.95	2.50	2606	515	48	19.76
.85	2.50	4065	673	55	8.24
.85	2.50	2774	601	48	21.67
.95	2.75	2774	447	40	16.11
.90	2.50	2423	480	48	19.81
1.75	3.50	3828	581	70	15.18
1.65	2.50	2816	417	66	14.81
1.95	3.50	2694	415	57	16.10
1.90	3.50	2543	470	53	18.48
1.95	3.50	2125	250	55	11.76
1.85	3.50	2145	260	57	12.12
1.85	3.50	2879	240	67	8.34

APPENDIX 7

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR POTATOES

WSP	RP	QTYT	QTY4	NS	CR4P
1.75	2.50	2692	240	80	8.92
2.60	2.75	2138	278	56	13.00
2.65	2.75	2958	330	81	11.16
2.50	3.50	3173	271	79	8.54
2.65	4.50	2337	252	72	5.39
2.55	3.50	1000	410	15	41.00
2.35	3.50	879	385	26	43.80
2.15	3.25	1976	586	24	29.66
1.95	2.75	2629	650	34	24.72
2.05	2.75	3407	847	41	24.86
2.00	3.25	4832	845	52	17.49
1.95	3.50	4314	827	48	19.17
1.85	3.50	3210	830	35	25.86

APPENDIX 8

PRICE AND MARKET STRUCTURE DATA FOR TOMATOES

WSP	RP	QTYT	QTY4	NS	CR4P
3.38	5.50	0	0	0	.00
3.13	6.50	9	9	2	100.00
3.50	5.50	27	27	4	100.00
4.13	5.50	131	82	17	62.60
3.75	4.50	170	166	6	97.65
3.88	5.50	253	130	23	51.38
3.63	4.50	159	86	14	54.09
3.38	4.50	91	77	7	84.62
3.25	5.00	51	37	8	72.55
3.50	5.50	172	115	11	66.86
.94	3.50	363	241	13	66.39
2.63	4.50	150	107	10	71.33
2.25	4.50	328	200	15	60.98
2.38	5.50	469	203	21	43.28
2.00	3.50	95	60	13	63.16
2.13	4.50	170	97	15	57.06
2.06	3.50	191	87	24	45.55
2.31	4.50	177	126	14	71.19
1.75	2.50	248	121	26	48.79
1.88	2.50	318	135	27	42.45

APPENDIX 8

CONTINUED

7.

PRICE AND MARKET STRUCTURE DATA FOR TOMATOES

WSP	RP	QTYT	QTY4	NS	CR4P
1.63	1.75	135	75	20	55.56
1.88	2.50	218	85	20	38.99
2.38	3.50	55	54	5	98.18
2.13	3.50	117	69	14	58.97
2.38	3.50	215	180	11	83.72
2.38	3.50	318	94	36	29.56
1.75	6.50	425	145	30	34.12
1.88	5.50	352	240	24	68.18
2.13	4.50	290	165	22	56.90
1.94	5.50	675	373	27	55.26
2.25	5.50	253	88	30	34.78
1.88	5.50	477	244	36	51.15
1.63	4.50	430	167	32	38.84
1.63	4.50	473	264	25	55.81
2.75	5.50	668	300	28	44.91
2.38	4.50	454	203	31	44.71
2.50	5.50	523	260	31	49.71
2.13	5.50	453	130	37	28.70

APPENDIX 8

CONTINUED

PRICE AND MARKET STRUCTURE DATA FOR TOMATOES

WSP	RP	QTYT	QTY4	NS	CR4P
2.88	5.50	1581	960	35	60.72
5.50	5.50	851	373	28	43.83
6.13	8.50	514	194	39	37.74
6.13	8.50	384	248	26	64.58
5.88	7.50	15	15	3	100.00
5.63	6.50	376	128	24	34.04
5.50	5.88	68	57	6	83.82
5.50	5.63	481	208	24	43.24
5.00	5.50	742	300	28	40.43
4.25	8.50	1439	450	42	31.27
4.13	5.00	980	239	40	24.39
2.63	5.50	1201	360	46	29.98

APPENDIX 9

CORRELATION MATRICES OF VARIABLES USED IN THE ANALYSIS, FOR THE SELECTED COMMODITIES

Bananas: Correlation Coefficients Between Variables

	WSP	RP	QTYT	QTY4	NS	CR4P
RP	.08					
QTYT	.14	.11				
QTY4	.12	.07	.97			
NS	.07	-.02	.76	.71		
CR4P	-.07	0.00	-.56	-.45	-.82	
CR4S	-.07	-.01	-.49	-.44	-.81	1.00

Cabbages: Correlation Coefficients Between Variables

	WSP	RP	QTYT	QTY4	NS	CR4P
RP	.68					
QTYT	.05	.38				
QTY4	.11	.43	.90			
NS	-.06	.34	.83	.65		
CR4P	.09	-.32	-.85	-.67	-.98	
CR4S	.08	-.32	-.85	-.65	-.98	1.00

Carrots: Correlation Coefficients Between Variables

	WSP	RP	QTYT	QTY4	NS	CR4P
RP	.59					
QTYT	-.32	-.26				
QTY4	-.32	-.25	1.00			
NS	-.34	-.14	.60	.59		
CR4P	-.24	-.16	.36	.36	.56	
CR4S	-.25	-.16	.37	.37	.57	1.00

APPENDIX 9

CONTINUED

Green Maize: Correlation Coefficients Between Variables

	WSP	RP	QTYT	QTY4	NS	CR4P
RP	.72					
QTYT	-.09	-.03				
QTY4	.00	.04	.95			
NS	-.10	-.14	.55	.46		
CR4P	.02	.08	-.24	-.16	-.77	
CR4S	.02	.08	-.23	-.14	-.75	1.00

Onions: Correlation Coefficients Between Variables

	WSP	RP	QTYT	QTY4	NS	CR4P
RP	.87					
QTYT	-.43	-.41				
QTY4	-.43	-.41	1.00			
NS	-.04	0.00	.46	.44		
CR4P	.25	.19	-.52	-.48	-.78	
CR4S	.25	.19	-.51	-.48	-.78	1.00

Oranges: Correlation Coefficients Between Variables

	WSP	RP	QTYT	QTY4	NS	CR4P
RP	.44					
QTYT	-.17	.15				
QTY4	-.15	.17	1.00			
NS	-.03	.10	.85	.86		
CR4P	.13	-.01	-.86	-.85	-.90	
CR4S	.13	-.01	-.86	-.85	-.90	1.00

APPENDIX 9

CONTINUED

Potatoes: Correlation Coefficients Between Variables

	WSP	RP	QTYT	QTY4	NS	CR4P
RP	.57					
QTYT	-.07	-.04				
QTY4	-.14	-.06	.89			
NS	.35	.33	.35	.08		
CR4P	-.35	-.33	-.26	.11	-.81	
CR4S	-.36	-.33	-.26	.11	-.82	1.00

Tomatoes: Correlation Coefficients Between Variables

	WSP	RP	QTYT	QTY4	NS	CR4P
RP	.68					
QTYT	.12	.34				
QTY4	.11	.33	1.00			
NS	-.10	.20	.64	.62		
CR4P	-.08	-.25	-.59	-.56	-.78	
CR4S	-.09	-.25	-.59	-.55	-.77	1.00